# BRITISH CHEMICAL ABSTRACTS

## B.—APPLIED CHEMISTRY

FEB. 13 and 20, 1931.\*

## I.—GENERAL; PLANT; MACHINERY.

Waste-heat boilers with horizontal settings [in gasworks]. E. S. DAVIES (Gas J., 1930, 192, 861-864).—Of the heat used for carbonisation, 17.8% is recovered from the waste gases in regenerators by preheating the secondary air, and a further 19% by a Spencer-Bonecourt Kirke waste-heat boiler. The "N.O.C." process, in which electricity, at a voltage of a few millivolts, is passed, at the rate of 0.1 kw. through a closed circuit in which the boiler acts as a conductor, is cheaper than the usual water-softening methods and keeps the boiler tubes free from scale. Details of a test on the boiler are given.

Heat transfer in ammonia condensers. III. A. P. KRATZ, H. J. MACINTIRE, and R. E. GOULD (Univ. Ill. Eng. Exp. Sta. Bull., 1930, No. 209, 50 pp.).— Results of tests of a horizontal shell-and-tube and a multitube-multipass type condenser are recorded. For given water velocities through the condenser tubes lower values of transfer coefficients are obtained when the identical shells are connected in series than when in parallel. The actual total capacity developed is a function of the amount of condensing surface, the limiting condensing pressure, the temperature, and the amount of water circulated; fouling of the tubes greatly reduces the coefficients. The general equation for heat flow in condensers may be used, under the conditions employed, to predict the coefficients (within 10%) for the multitube-multipass ammonia condenser.

CHEMICAL ABSTRACTS.

Electrofiltration. PURI.-See XVI.

## PATENTS.

Furnaces. Blocks or tiles for furnace walls. BABCOCK & WILCOX, LTD. From FULLER-LEHIGH Co. (B.P. 339,052 and 339,055, [A] 10.8.29, [B] 11.8.29).-(A) A furnace for burning powdered anthracite or other fuel has the lower part of the front and back walls inclined to form a V, the sloping sides being kept cool by water tubes or other means. The finely-divided fuel is admitted downwards from the upper part and the air upwards through a chain-grate at the apex of the V at a velocity sufficient to maintain the fuel completely in suspension, even that part that slides down the walls. It is intended that the particles of ash should frit together until they are heavy enough to remain on the grate and be removed by it. (B) Blocks of refractory material are dove-tailed and cemented into metallic blocks which are shaped on the back to accommodate water-cooling tubes. B. M. VENABLES.

Rotary tube furnaces [having removable stirrer arms]. T. LANG, Assee. of METALLGES. A.-G. (B.P. 319,335, 20.9.29. Ger., 20.9.28).—The stirrer arms, which are air-cooled, project through openings in the side of the furnace which are lined with metal having a higher thermal expansion than has the furnace masonry. A. R. POWELL.

Regulating the temperature of flowing reaction. mixtures. Holzverkohlungs-Ind. A.-G. (B.P. 339,144 and Addn. B.P. 339,148, [A] 30.12.29, [B] 31.12.29. Ger., [A] 18.1.29, [B] 2.11.29).—In an apparatus for exo- or endo-thermic reactions between constituents of a gaseous or fluid mixture, the reaction zone is situated on one side of a heat exchanger and the temperature is kept constant and reasonably uniform throughout the reaction zone by continuously circulating through the other side of the exchanger the mixture before reaction at a greater rate than the flow required for consumption. The minor quantity for the reaction is tapped off the circulation just before it leaves the heat exchanger and passes through the reaction side in a countercurrent direction, and a corresponding quantity of fresh mixture is drawn in at the suction side of the circulating pump. The temperature is regulated by the rate of circulation and by the provision of a heater or cooler in the main circuit outside the reaction exchanger. In (B) the process may be applied to gases under pressure.

B. M. VENABLES.

Mercury boilers. BRIT. THOMSON-HOUSTON CO., LTD., Assees. of [A] W. LER. EMMET and [A, B] B. P. COULSON, JUN. (B.P. 319,220 and 339,237, [A] 17.9.29, [B] 14.6.30. U.S., [A] 17.9.28, [B] 14.6.29).-(A) In a mercury boiler a heating element is composed of a group of doubleconcentric return tubes arranged almost vertically, the lower closed ends of which are heated by radiation, but, owing to the increased pressure due to the head of mercury, ebullition takes place only in the upper parts. which are heated entirely by convection. Actually the inner tubes are double-walled (making three concentric tubes in all) with a hermetically sealed dead space between; the outer annulus of mercury is maintained at a uniform small thickness by projections on the middle tube. Baffles and solid displacers are also placed in the vapour drum to reduce the quantity of mercury locked up. (B) In a boiler of the type described in (A), arrangements for leading liquid mercury into the inner down-tubes and for reducing the quantity of liquid mercury locked up are described. B. M. VENABLES.

Dryers [for sheet materials, e.g., wall-board]. (A, B) COE MANUFG. CO., Assees. of A. J. VANCE. (C) A. E. WHITE. From COE MANUFG. CO. (B.P. 314,013, 314,982, and 337,432, 29.5.29. U.S., [A] 21.6.28, [B] 7.7.28).—The sheet material is caused to progress continuously through a casing once only in a longitudinal direction, but preferably in several independently

D. K. MOORE.

<sup>\*</sup> The remainder of this set of Abstracts will appear in next week's issue.

supported stories with heating means such as steam coils under each. Air is caused to circulate longitudinally through the casing and back outside it, (A) in one circuit, (B) in several substantially independent circulations each traversing part of the length ; the flow may be con- and/ or counter-current in the dryer and steam may be admitted in the earlier stages. Each supply of circulating air is split not only by twin fans (entry and exit then being to or from both sides), but also by guides, so that the number of layers of air is one more than the number of storeys of goods. The return conduits are preferably above the casing and the circulating fans situated at the withdrawal end so that the dryer is maintained under slight vacuum and the return conduit under slight pressure, the minor quantity of saturated air or steam being vented out near the fan. Patent (c) refers mainly to the construc-B. M. VENABLES. tion of the casing of the dryer.

Rotary drums for drying purposes. DEUTS. BABCOCK & WILCOX DAMPFRESSEL-WERKE A.-G., and A. W. KRAMLOWSKI (B.P. 338,265, 12.9.29).—An elaborate system of lifting and spreading shelves is described for the interior of a rotary drum dryer.

B. M. VENABLES. [Gear- and chain-driven] drying or evaporating apparatus of the heated-roller type [for milk, foodstuffs, etc.]. A. ST. J. GATES (B.P. 334,355, 6.8.29).—The rollers are provided with sprockets which are driven by the same chain and with a further sprocket which is connected to a suitable source of power through a worm reduction gear. A. R. POWELL.

Cooling agents. N. CARO and A. R. FRANK (B.P. 339,194, 6.2.30. Ger., 8.2.29).—Aqueous ammonia is used as a cold-conveying agent in processes involving the liquefaction or freezing of nitrogen oxides; the solution may contain also f.-p. depressants, *e.g.*, ammonium salts, metal nitrates or thiocyanates.

B. M. VENABLES. Grinder. R. PRATER (U.S.P. 1,768,713, 1.7.30. Appl., 17.3.27).—The apparatus is suitable for "cracking" corn or similar purposes. It comprises a number of beaters increasing in diameter away from the feed end and driven by a horizontal shaft. The lower portion of the casing is perforated and conical, the upper portion cylindrical and imperforate. B. M. VENABLES.

Mixing and/or grinding or crushing machines. G. H. and P. S. Howse (B.P. 338,232, 23.8.29).—The apparatus comprises a rotating drum in which are suspended, loosely but in such a manner that their axes are always in line with the drum, a number of rollers which make contact with the lower part of the circumference of the drum or the material thereon. The rollers may be in sections and some or all helical so that good longitudinal mixing is produced.

B. M. VENABLES.

Disintegrating, tearing, kneading, mixing, drying, or like machines. DEBERAG DEUTS. BERAT-UNGSGES. F. DIE CHEM. U. METALLURG. IND. M.B.H. (B.P. 338,316, 19.10.29. Ger., 19.10.28).—The apparatus comprises a cylindrical casing provided with an inlet at one end and an outlet at the other so that a continuous process may be maintained, and, if desired, with a jacket for heating or cooling. A number of radial arms are

freely mounted on an axial rod within the casing and these are driven by a cylindrical cage-like member, which is rotated by power about an axis which is eccentric to that of the casing and preferably below it, the arms being threaded through suitable holes in the cage. The result is that the radial stirrers rotate at different speeds at different points (faster at the top) and the material is also squeezed between the cage and the casing and is prevented from sticking to the arms by the scraping action of the cage on them. Longitudinal motion may be produced by helical grooves on suitable surfaces. B. M. VENABLES.

Mixing and blending systems. FULLER Co., Assees. of J. H. MORROW (B.P. 338,123, 8.8.29. U.S., 3.10.28).—Pulverulent materials are delivered, preferably by the Fuller–Kinyon air-borne conveying system, to a number of silos in rapid succession so that a number of thin layers are formed in each, and then the material is withdrawn from several silos or several layers simultaneously. The intervals and sequence of the transfer may be electrically controlled. B. M. VENABLES.

Mixing apparatus. J. A. PICKARD (B.P. 338,945, 1.8.29).—The apparatus is suitable for mixing powder or other material into a stream of liquid. The main conduit is provided with a stopcock across which is a by-pass. The by-pass route embodies isolating co-ks and a feeding chamber, which is charged with powder when the cocks are closed and through which the liquid subsequently passes in an upward direction, the withdrawal of solid being observable through a window. There is also a sighting device in the main stream after the by-pass rejoins. B. M. VENABLES.

Mixing of gaseous fluids and solid particles. BABCOCK & WILCOX, LTD. From FULLER-LEHIGH CO. (B.P. 339,056, 11.10.29).—The device is for destroying stratification in a stream of gas carrying solid particles, so that it may be divided into a number of streams of identical composition. The supply conduit of round or other ordinary section is changed to narrow rectangular and again to narrow rectangular at right angles to the first, all three cross-sectional areas being about equal. The subdividing means, *e.g.*, hinged flaps and separate conduits for each stream, are situated at the second rectangular section. B. M. VENABLES.

Agitator, aerator, and mixer. W. N. JONES and C. C. HUMPHREYS, Assrs. to ROTEX ENG. Co. (U.S.P. 1,765,338, 17.6.30. Appl., 14.11.28).—The apparatus comprises a unit, one or more of which may be stood in a tank of liquid. A motor at the top drives a propeller at the bottom by means of a vertical shaft. The propeller rotates within cut-out portions of vertical radial baffles. When aeration is desired the spe d is raised sufficiently to break the surface of the liquid and air is drawn in through small pipes extending close to the blades of the propeller. B. M. VENABLES.

Determining the degree of saturation of materials which have been immersed in liquids. W. & T. AVERY, LTD., W. A. BENTON, and P. E. GOFF (B.P. 338,282, 26.9.29).—In a mass of material under treatment, *e.g.*, barley steeping in water, are embedded a number of frusto-conical baskets containing samples of the material which are adapted to be placed in a centrifuge and then upon a weighing machine. If the baskets are adjusted to constant tare and a constant weight of dry sample is taken, the scale of the weighing machine may read directly in percentage of moisture.

B. M. VENABLES.

Apparatus for expressing liquids from solids. J. CRICHTON & CO., LTD., and J. CRICHTON (B.P. 338,850, 20.6.29).—The cylindrical wall of a press is formed of a helical band, the outlet for fluid being between the turns. B. M. VENABLES.

Preparation of adsorbent materials. H. E. BIERCE (U.S.P. 1,752,721, 1.4.30. Appl., 9.5.28).— Clay containing 10—20% of moisture, and crushed to a fineness of from  $\frac{1}{2}$  in. to 200-mesh, is mixed with an organic acid, *e.g.*, oxalic acid, and heated to 90—120°, the product being pulverised. The addition of 1, 2·5, and 5% of oxalic acid to raw standard Utah clay increased its decolorising efficiency (when tested on a lubricating oil) from 100 to 108, 139, and 155%, respectively. W. J. WRIGHT,

Effecting continuous discharge of solid matters from centrifugal bowls with unperforated bowl wall. AKTIEB. SEPARATOR (B.P. 339,566, 28.2.30. Swed., 4.3.29).—Mercury is placed in the bowl and forms a layer which prevents sticking of the sludge. The heavier liquid may be relied on to discharge the sludge, or a carrier liquid may be supplied through special channels in such a way as to swirl past the entrances of the discharge channels and to sweep along the surface of the mercury in an axial direction. B. M. VENABLES.

Sterilisation or like heat treatment of liquids. BERGEDORFER EISENWERK A.-G. (B.P. 338,422, 9.1.30. Ger., 9.1.29).—In apparatus of the type in which the liquid (e.g., milk) is heated and cooled by heat exchange with itself, external heat being supplied only to the hightemperature stage, the heating side of the first stage is preferably of the trickle type to facilitate removal of bad gases, whereas the other stages are of the closedtube type. In any case several stages are used with means to by-pass one or more. Devices for separating or filtering may be connected between heat-exchange stages. B. M. VENABLES.

Continuous distillation. N. E. LOOMIS, Assr. to STANDARD OIL DEVELOPMENT Co. (U.S.P. 1,756,032, 29.4.30. Appl., 8.6.22. Renewed 17.5.28).-A series of still and rectifier units are operated at increasing temperatures; when required, e.g., for the production of lubricating fractions from petroleum, the temperatures may be kept low by means of vacuum pumps. Each unit comprises a coil heater, rectification tower, and condenser for the lighter fractions, the last-named being collected in parallel. The discharges from the bottoms of the towers are reheated and passed mostly to the (respective) next tower, but some of the reheated oil is sent back to the lower part of the tower from which it came in order to regulate the temperature. Independent means for heating at the bottoms and for partial condensation at the top may be provided.

B. M. VENABLES. Vapour outlet for stills. R. E. WILSON, Assr. to STANDARD OIL CO. (U.S.P. 1,767,196, 24.6.30. Appl., 22.5.24).—The vapour is admitted to an internal outlet pipe through a longitudinal slit on the upper circumference; the slit is provided with lips leading to internal plates which catch moisture and lead it to the bottom of the outlet pipe, whence it drains back into the still.

B. M. VENABLES.

Distributors for gases carrying solids in suspension. BABCOCK & WILCOX, LTD. From FULLER-LEHIGH Co. (B.P. 338,327, 26.10.29).—A stream of, e.g., air-borne coal dust is divided into several streams of even composition by passing it first through a bend which has a flat surface on the outside, which acts as a mixer, then through a fan-shaped piece (of conduit) to form a wide thin stream, after which it is divided by a number of oppositely tapered, narrower, fan-shaped pieces which lead the individual streams to round pipes.

B. M. VENABLES.

Filtering apparatus for separating fibre and dust from air. R. and J. GREENHALGH (B.P. 339,514, 24.12.29).—The apparatus comprises a number of bag filters with fixed dust-receiving chambers below and movable inlet headers above. The filters are divided into groups which can be shaken in turn by jarring the inlet header of a group; the group headers are connected to a main inlet header by means of collapsible pipes which are closed by pressing their sides together when shaking takes place. B. M. VENABLES.

Treatment of exhaust gases of internal-combustion engines to render them innocuous. L. GAISMAN and S. J. PEACHEY (B.P. 338,933, 24.7.29 and 19.5.30).— Air under a sufficient pressure is admitted to the exhaust pipe and the mixture passed through a silencer or other chamber containing a catalyst able to cause oxidation of carbon monoxide, *e.g.*, a combination of nickel wiregauze discs, palladised pumice, and asbestos, or a worm covered with a palladised material.

B. M. VENABLES.

Dispersal of fog or mist. H. A. LLOYD and F. A. WRIGHT (B.P. 339,295, 5.6.29).—A stream of heated air is produced by an electric fan surrounded by electric heaters. B. M. VENABLES.

Manufacture of vessels and other structures that are proof against chemical and atmospheric influences. P. PICK (B.P. 339,320, 4.7.29. Ger., 23.7.28). —Hollow vessels are constructed from the elements described in B.P. 316,134 (B., 1931, 3). The edges of the metal are bared and joined by known means, and the bare joints are re-covered with the plastic material as before. B. M. VENABLES.

[Saddle-shaped] filling bodies for reaction and washing towers and the like. E. BERL (B.P. 319,239, 30.8.29. Ger., 18.9.28).—The bodies are in the shape of a saddle having its breadth equal to its depth and its ends projecting slightly outwards. A. R. POWELL.

[Hollow cylindrical] filling bodies for use in distilling columns, absorption towers, reaction vessels, etc. F. WEINREB and C. H. BUTCHER (B.P. 335,889, 28.6.29).—Both ends of the cylinders are rounded and smooth. A. R. POWELL.

Effecting heat exchange. W. D. LA MONT and A. F. ERNST, ASSIS, to LA MONT CORP. (U.S.P. 1,783,724,

2.12.30. Appl., 7.10.26).—See B.P. 278,704; B., 1929, 495.

Apparatus and processes for treating materials. C. W. VOGT, ASST. to VOGT INSTANT FREEZERS, INC. (U.S.P. 1,783,864—6, 2.12.30. Appl., [A] 1.11.28, [B] 17.3.28, [C] 31.12.28).—See B.P. 330,887 and 332,577 ; B., 1930, 838, 887.

Mixing apparatus. A. B. and C. R. SMITH (U.S.P. 1,782,795, 25,11.30. Appl., 7.9.29. U.K., 22.3.29).— See B.P. 328,401; B., 1930, 645.

Centrifugal apparatus. R. M. BERLINE, Assr. to SHARPLES SPECIALTY Co. (U.S.P. 1,784,510, 9.12.30. Appl., 7.5.29. Luxemb., 7.5.28).—See B.P. 311,248; B., 1930, 886.

Filtering apparatus. E. W. W. KEENE (U.S.P. 1,783,937, 2.12.30. Appl., 1.3.30. U.K., 8.11.28).— See B.P. 326,221 ; B., 1930, 444.

Production of adsorbents [from flue dust]. H. B. Rüder, Assr. to Lurgi-Ges. F. Wärmetechnik M.B.H. (U.S.P. 1,784,543, 9.12.30, Appl., 22.10.27, Ger., 11.11.26).—See B.P. 280,505 ; B., 1929, 8.

Regeneration of adsorption material. V. PAN-TENBURG, Assr. to AMER. LURGI CORP. (U.S.P. 1,784,536, 9.12.30. Appl., 23.7.25. Ger., 12.11.24).—See B.P. 242,986; B., 1927, 287.

[Boiler] furnaces. JOHN THOMPSON WATER TUBE BOILERS, LTD., and H. E. PARTRIDGE (B.P. 339,374, 16.9.29).

Operation of furnaces, particularly steam boilers. I. Arbatsky (B.P. 338,174, 10.6.29).

Apparatus for removing sludge from water blown down from steam boilers. FILTRATORS, LTD., and V. V. SAKS (B.P. 302,942 and 312,332, [A] 22.6.27, [B] 24.5.29).

**Refrigerating plants.** A.-G. BROWN, BOVERI, & CIE. (B.P. 318,597, 6.9.29. Ger., 6.9.28).

Method of cooling and condensing in periodically working absorption refrigerating plants. DEUTS. GASGLÜHLICHT-AUER-GES.M.B.H. (B.P. 313,890, 18.6.29. Ger., 18.6.28).

Subjecting materials to indirect heat (U.S.P. 1,763,758).—See II. Atomisers for liquids (B.P. 324,565).—See VII. Pulverulent products (B.P. 338,463).—See IX. Metallurgical furnaces (B.P. 338,893).—See X. Precipitation from gases (B.P. 338,427 and 338,944; U.S.P. 1,766,421-2, 1,767,265, and 1,767,338).—See XI.

## II.-FUEL; GAS; TAR; MINERAL OILS.

Coke breeze. E. W. SMITH (J. Inst. Fuel, 1930, 4, 113—116).—The quantity of coke breeze formed in gasworks is greater with continuous than with static carbonisation. Semi-caking coal yields more breeze than a highly caking coal. Cleaning and fine-grinding of the coal reduce breeze production; over-coked and uncarbonised coke have the opposite effect. Coke breeze can be utilised in gas producers for blending with coal that is to be carbonised, and for steamraising. D. K. MOORE.

Asphaltic bitumen, its properties and applications. J. S. JACKSON (J. Oil Col. Chem. Assoc., 1930, 13, 304-312).-The greater part of the bitumen in use is prepared artificially by the removal of the more volatile constituents from asphaltic-base crude petroleum oils. Its preparation in the Trumble plant is described. The various grades of bitumen are usually classified according to their consistency, and this test and those for ductility and ring-and-ball m.p. are given. For the purpose of analysis bitumen may be separated into three classes of compounds: (a) oily constituents; (b) semi-solid, sticky, resinous bitumenes; (c) darkbrownish solid asphaltenes. "Blowing" of bitumen with air results in an increase in the m.p. and an alteration of the character of the bitumen. Typical figures for a representative range of asphaltic bitumens are tabulated and their commercial applications, such as the making of emulsions, roof felt, road tar, and in the electrical industries, are described. H. S. GARLICK.

Determination of wax in pitch. W. LITTLEJOHN and W. H. THOMAS (J. Inst. Petroleum Tech., 1930, 16, 814-824).-The effect of a number of variables on the determination of wax in pitch by the cracking-distillation method has been investigated and a standardised method suggested, in which 10 g. of a sample are distilled up to 500° in a 70-c.c. glass retort at the rate of a 15° rise in temperature per min. Pure acetone is added (35 c.c. per g.) to the weighed distillate, and the mixture is The solution is cooled, held at  $-32^{\circ}$  for refluxed. 5 min., filtered as rapidly as possible, and washed with the minimum quantity of acetone. The wax is dissolved in light petroleum, the solution evaporated, and the wax redissolved in acetone (70 c.c. per g. of wax). Precipitation is effected at 0°, the wax is filtered, redissolved in light petroleum, the solution evaporated, and the wax content calculated on the original sample, the result being expressed as a percentage of wax determined at 0° (and/or -32°) precipitated from acetone. The m.p. also should be determined and recorded.

H. S. GARLICK.

**Creosote oil.** K. A. Porov (III Coll. Art. Inst. Mat. Comm. Communic., Moscow, 1929, No. 8, 112, 13—39).— Creosote oil for impregnation of wood should contain not more than 8-10% boiling below 205°, and the final b.p. should not exceed 355°. Not more than 25% of soft pitch and 0.5% of free carbon should be present.

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Industrial uses of fuel oil. I. LUBBOCK (J. Inst. Fuel, 1930, 4, 90-105).—Descriptions of the application of oil-firing to glass furnaces, the ceramic industry, metallurgy, cement manufacture, and domestic appliances are given. D. K. MOORE.

Turbine oils. N. I. TSCHERNOSHUKOV (Azerbaid. Neft. Choz., 1930, No. 7—8, 96—99).—Types of turbine oil sludges are described. The stability of such oils is best determined by Butkov's method (B., 1929, 119) : the product most not require more than 1 mg. of potassium hydroxide per g., and should contain not more than 0.15% of sediment. CHEMICAL ABSTRACTS.

Petroleum from Chusovskikh Gorodkov. I. V. Postovski and V. G. PLJUSNIN (J. Chem. Ind. Russia, 1929, 6, 776—779).—The oil contained C 82.86, H 10.17, S 4.09, N 0.33, O 2.65%, and had  $d^{15}$  0.9545,  $E^{20}$  3.08. CHEMICAL ABSTRACTS.

Total heat and sp. heat of a series of fractions of petroleum oil, and their relation to other properties. H. R. LANG, R. JESSEL, and A. H. STEED (J. Inst. Petroleum Tech., 1930, 16, 783-813).-Five fractions were prepared from Miri benzine and kerosene and their sp. heat, total heat, and the variation of these with temperature were measured, as were also the mean mol. wt., refractive index, sp. gr., and expansion coefficient. The determination of sp. heat between 0° and 100° was made by the continuous-flow electric method. For temperatures above 100° an apparatus was devised, based on direct measurement of the fall of total heat of a stream of oil by cooling it with a stream of water, which can be used at pressures other than atmospheric for both the liquid and the vapour phases. The mean mol. wts. were determined by the cryoscopic method, using nitrobenzene as the solvent. The results show a direct linear relationship both to the sp. gr. and to the refractive index. A detailed discussion of the apparatus and results obtained is given.

H. S. GARLICK.

Waste-heat boilers in gasworks. DAVIES.—See I. Ammonium sulphate and nitrate mixtures. GLUUD and others.—See VII. Asphalts and bitumens on rubber estates. SUTCLIFFE.—See XIV.

See also A., Jan., 41, Water-gas equilibrium constant (EMMETT and SHULTZ). 44, Gaseous combustion in electric discharges (FINCH and PATRICK). Ignition of carbon monoxide-oxygen mixtures (BREWER and DEMING). 54, Analysis of mixtures of hydrogen, methane, and ethane (MULDERS and SCHEFFER). 60, "Fibrous lignites" and "fibrous coal" (GOTHAN and BENADE). Occurrence of resin in Ruhr coals (HOFFMANN and KIRCHBERG). Condensation of hydrocarbons by electrical discharge (LIND and GLOCKLER). Production of liquid hydrocarbons from propylene (MAILHE and RENAUDIE). 78, Behaviour of benzenoid hydrocarbons in the Tesla discharge (AUSTIN and BLACK).

## PATENTS.

Separation of combustible material from its associated non-combustible material. W. L. REMICK (U.S.P. 1,767,400, 24.6.30. Appl., 27.5.29).— Coal and slate are separated by a combination of gravity separation and flotation processes. A preliminary gravity separation is effected by washing in an upward current of water. The large coal is separated from the fines and small slate particles by means of a dewatering screen. The fines, slate particles, and separated wash-water are mixed with oil and air in a pump and returned to the washing tank through revolving jets. The oiled coal particles adhere to the large coal and are removed with them at the screen.

H. E. BLAYDEN. Coking retort oven. J. BECKER, Assr. to KOPPERS Co. (U.S.P. 1,755,383, 22.4.30. Appl., 16.5.21).—The heating walls of the coking chamber of a battery contain a group of horizontal combustion flues disposed vertically above each other and extending from side to side of the chamber. Each group of flues works in conjunction with an inflow and an outflow regenerator also extending from side to side of the chamber and being parallel to the heating walls. Means are provided for reversal of the direction of flow of gases in the regenerators and flues in such a manner that all the flues of the battery operate as burning flues. Provision is also made for heating the battery by means of preheated air and producer gas etc. H. E. BLAYDEN.

Removal of distillation products from the lower part of coke ovens. K. BEUTHNER (B.P. 337,278, 3.1.30. Ger., 3.1.29).—The door and fuel support which closes the bottom of a vertical coke oven has a hood consisting of a closed part and a part which is open on the inner side, the lateral opening of this part running in the direction of the middle longitudinal plane of the chamber. The opening is so arranged that the material to be distilled only partly fills the open part of the hood on account of its natural angle of repose, leaving free a space suitable for removing the distillation gases. At the end of the distilling period steam may be introduced into the coke oven through the open-hood part. A. B. MANNING.

Coke-oven heating flue. C. E. UNDERWOOD and J. A. BEATTY, ASSTS. to BETHLEHEM STEEL CO. (U.S.P. 1,751,775, 25.3.30. Appl., 27.4.26).—The centre bricks at the ends of the heating flue walls of the oven have their outer faces flush with the terminal bricks of the side walls, and have on their outer side filler bricks which overlap the joints between the side walls and the centre bricks. Flash plates embrace the filler bricks and the terminal portions of the side walls.

A. B. MANNING. Chamber ovens for producing semi-coke and similar products. Soc. GÉN. DE FOURS À COKE, SYSTÈMES LECOCQ (B.P. 336,809, 28.10.29. Belg., 27.10.28).—Coal is coked in narrow metallic enclosures on either side of which are heating walls of refractory material. The walls of the enclosures are spaced from the heating walls so that they are heated only by radiation. A. B. MANNING.

Heat treatment of vegetable and mineral substances. F. K. WOODROFFE (B.P. 336,657, 18.7.29).— The material is fed in at one end of a retort upon the bottom of which it is distributed by paddles which are given an oscillatory movement across and a longitudinal movement along the retort, so that the material is gradually conveyed from the inlet to the discharge end. The retort is preferably sector-shaped in cross-section, the bottom being formed of curved metal plates, and is adapted to be heated from below. A. B. MANNING.

Apparatus for subjecting materials to the action of indirect heat. McG. CLINE, Assr. to WOOD PROCESS Co., INC. (U.S.P. 1,763,758, 17.6.30. Appl., 17.6.26).— The apparatus is suitable for the destructive distillation of sawdust etc. It comprises a number of superposed, hollow, annular shelves supported by a fixed central flue, the material being raked over the shelves in succession by arms projecting inward from a rotating outer shell. Heating of the shelves is effected by gases rising through spaces left between the wall of the flue

and the lower inner edges of the annuli, and radial conduits extending from near the outer circumference back to the flue permit the gases to leave the shelves. By dividing the central flue into a number of truncated cones with closed small (and lower) ends a form of stage-heating may be obtained. B. M. VENABLES.

Apparatus for ascertaining the fractionating temperatures of fractionatable constituents of solid carbonaceous and other materials [e.g., ores]. J. W. H. AINSCOW (B.P. 318,966, 2.9.29. Austral., 13.9.28).—The apparatus comprises a small, inclined tubular retort with suitable inlets, outlets, and thermometer pockets; it is also provided with an internal stirrer the shaft of which is rather below the axis of the tube, and with a setting to produce uniform heating. B. M. VENABLES.

Reactivation of contaminated adsorptive carbon. METALLGES. A.-G. (B.P. 313,154, 15.5.29. Ger., 8:6.28). —The carbon, with the addition of a binding medium if desired, is moulded into blocks, which are then treated, without external heating, with gaseous mixtures containing not more than 8% of free oxygen, e.g., mixtures of air and steam, at temperatures at which the impurities in the carbon are eliminated without any appreciable loss of carbon by combustion. The carbon may be treated with water, acids, or other solvents prior to reactivation. A. B. MANNING.

[Destructive] hydrogenation of [bituminous] coal. IMPERIAL CHEM. INDUSTRIES, LTD., R. HOLROYD, and C. COCKRAM (B.P. 337,028, 18.7. and 28.12.29).— Bituminous coal is heated at or just above the temperature of initial thermal decomposition (cf. Holroyd and Wheeler, B., 1929, 116), with or without hydrogen, and the product is then subjected to destructive hydrogenation. The first stage of the treatment may be carried out under pressure, hydrogen being added in sufficient amount to deoxygenate the coal and convert it into a fusible product. Both stages may be performed in the presence of an oil and of catalysts, particularly massive metal catalysts. A. B. MANNING.

Destructive hydrogenation [of solid carbonaceous materials suspended in a liquid]. C. F. R. HARRISON, E. D. KAMM, and IMPERIAL CHEM. INDUS-TRIES, LTD. (B.P. 336,610, 16.7.29).—The total products of destructive hydrogenation are withdrawn from the reaction vessel and led to a hot catch-pot maintained at such a temperature, e.g.,  $350^\circ$ , that the light oils and middle oils remain in the vapour phase, while the heavy oils are condensed or remain unvaporised, and are led back to the process without substantial loss of heat. When solid matter is present in the reaction products it may be separated, e.g., by centrifuging, before returning the oil to the process. A. B. MANNING.

Destructive hydrogenation [of carbonaceous materials]. C. F. R. HARRISON, and IMPERIAL CHEM. INDUSTRIES, LTD. (B.P. 336,991, 19.7.29).—Coals and oils are hydrogenated in the liquid phase under pressure in a vertical tower (cf. B.P. 308,995 and 309,258; B., 1929, 465, 457) wherein is mounted a massive catalyst of relatively large surface area. The catalyst may comprise a number of units each consisting of a number

of plates, assembled side by side, and mounted at right angles to the cross-section of the tower.

A. B. MANNING. Gas producers. A. L. GALUSHA (B.P. 337,005, 23.7.29).—A gas producer is provided with an overhead feed bin (surmounted, if desired, by a storage bin) capable of holding fuel sufficient for a relatively long period of working. The producer is connected with the bin by means of hollow columns which open into the producer in such a way as to maintain a constant level of fuel bed therein and at the same time leave a sufficient gas space above the bed. A. B. MANNING.

Gas-producer furnaces. L. RAINCHON (B.P. 336,887, 13.1.30. Addn. to B.P. 255,329; B., 1926, 734).—A furnace in accordance with the prior patent has, on the front side, below the guide surface which conducts the coal from the hopper to the furnace, a primary air channel and an opening for cleaning purposes, and at the rear side, at a level below that of the discharge opening of the loading hopper, a secondary air channel, a second air-admission channel, and a cleaning opening which also serves the purpose of a channel for the admission of air. A. B. MANNING.

Gas manufacture. F. W. STEERE, Assr. to SEMET-SOLVAY ENG. CORP. (U.S.P. 1,752,278, 25.3.30. Appl., 25.4.25).-The apparatus comprises a generator, a carburettor, a superheater, and a wash box in series, and also a checkerbrick chamber adjacent to and connected with the base of the generator. A gas conduit leads from the top of this heat-storage chamber to the connexion between the superheater and wash box. After air-blasting the fuel bed and burning the blast gases in the carburettor and superheater, water is injected into the top of the latter through water sprays and the steam so formed is passed through the carburettor and down through the fuel bed; the hot water-gas produced is passed through the heat-storage chamber and thence through the wash box to storage. An up-run may then be made by spraying water into the heat-storage chamber, and also into the bottom of the generator, and passing the steam so formed up through the fuel bed, the water-gas produced being passed through the carburettor, superheater, and wash box to storage. A. B. MANNING.

Water-gas apparatus. F. W. STEERE, Assr. to YOUNG-WHITWELL GAS PROCESS CO. (U.S.P. 1,751,497, 25.3.30. Appl., 7.5.23. Renewed 6.8.27).—A watergas set comprises a generator, carburettor, and superheater, connected in series by unobstructed passages. Another passage connects the bottom of the generator with the gas offtake leading to the wash box. A by-pass connexion is provided between this second passage and the main passage, and a jet which supplies steam for the down-run is mounted in the by-pass in such a manner that by its injector action a part of the water-gas produced is re-circulated through the superheater, carburettor, and generator, admixed with the steam.

A. B. MANNING. Back-run method of operating gas plants. G. E. WHITWELL, Assr. to YOUNG-WHITWELL GAS PROCESS Co. (U.S.P. 1,752,223, 25.3.30. Appl., 26.4.23. Cf. U.S.P. 1,751,497; preceding abstract).—In the manu-

facture of carburetted water-gas a step is introduced in which a mixture of combustible gas and steam is passed successively through a single superheater, a single carburettor, and through the fuel bed of the generator, whereby water-gas is produced. A. B. MANNING.

Heating of regenerator chambers in the continuous production of water-gas. J. PINTSCH A.-G. (B.P. 318,174, 24.8.29. Ger., 29.8.28).—In the method employing as gasifying agent a current of water-gas and steam heated in an apparatus of the regenerator type, itself heated by the combustion therein of part of the water-gas produced, the temperature of the heating apparatus is regulated by the introduction of flue gases, or a mixture of flue gases and steam, by means of a blower which recirculates part of the combustion products from the heating apparatus.

A. B. MANNING.

**Production of water-gas.** E. S. ANDREWS. From J. PINTSCH A.-G. (B.P. 336,965, 22.7.29).—Finelydivided solid carbonaceous material is gasified in steam, or in a mixture of steam and water-gas, in such a way that the gasifying agent, preheated in a regenerator surrounding the reaction tube, is introduced into the latter at a number of points arranged progressively along the tube from the end where the fuel enters.

A. B. MANNING. Production of water-gas from pulverulent and fine-grained carbon. METALLGES. A.-G., and C. MUELLER (B.P. 336,821, 4.11.29).—The fuel is gasified with oxygen admixed with steam, part of the gas produced being introduced into the current of oxygen and steam and burned therein before the thereby highly preheated gasifying medium reaches the fuel. 8

A. B. MANNING. Absorption process [for removing gasoline from natural gas]. P. T. SHARPLES, ASST. to SHARPLES SPECIALTY CO. (U.S.P. 1,766,195, 24.6.30. Appl., 4.4.25).—In an enclosed cyclic system a condensible hydrocarbon is absorbed in a suitable oil which is subsequently stripped of the absorbed hydrocarbon by distillation. A portion of the stripped oil is purified from contaminating material of a higher sp. gr. than that of the oil by centrifuging while hot; the by-passed oil is then returned with the main supply of oil to the absorption process. H. S. GARLICK.

Recovery of benzol and the like [from coaldistillation gas, water-gas, etc.]. P. T. SHARPLES, Assr. to SHARPLES SPECIALTY Co. (U.S.P. 1,766,196, 24.6.30. Appl., 20.7.25).—After the wash oil is debenzolised by distillation, it is centrifuged at 95—100° to remove suspended particles of finely-divided matter. The stripped and centrifuged oil is then returned to the scrubbing tower. C. B. MARSON.

Apparatus for treating asphaltic oils for production of asphalt. M. R. L. MILLER (U.S.P. 1,766,446, 24.6.30. Appl., 8.1.27).—A metallic still jacketed with asbestos is provided with a heating furnace and internal cooling pipes submerged in the oil. A suitable cooling fluid such as gas or oil can be made to flow through these pipes, the flow being regulated by thermostatically controlled valves, and other pipes are arranged to blow air through the contents of the still. The still is heated externally, and air is simultaneously blown through the oil. When the temperature of the oil reaches 127° the furnace is shut off and the supply of air continued to effect oxidation of the oil. Increase of temperature of the oil above that at which destructive distillation commences is prevented by the action of the valves mentioned above. The flow of air is increased from 300 to 700 cub. ft. per min over a period of 6-7 hrs. The whole process may occupy 18-70 hrs. according to the nature of the required product. During oxidation steam is led into the still above the oil to prevent ignition of oil vapours. The steam and oil vapours may subsequently be condensed. When high-gravity oils are to be treated, steam may be blown through the oil to effect a preliminary distillation, the product being then treated as described. H. E. BLAYDEN.

Treatment of bitumen, bituminous preparations, tar, etc. for electrical and other uses. D. ANDERSON & SON, LTD., and R. O. CHILD (B.P. 339,470, 25.11.29).—The material to be treated is mixed in a normal or heated condition with preferably an approximately equal quantity of a suitable solvent and treated with a suitable quantity of colloidal silicic acid. After settlement, the purified solution is decanted through a filter-bed of silicious material or treated with a further quantity of silicic acid and centrifuged before distilling to reduce the solution to a desired viscosity.

H. S. GARLICK.

Separation of tars, tar oils, petroleum, and the the like into fractions of technical value. KÁRPÁTI (B.P. 336,945, 18.6.29. Cf. B.P. 283,569; B., 1929, 424).—The raw material is brought into solution in an aqueous organic medium, e.g., aqueous alcohol (30-70%), at a raised temperature, preferably above the b.p. of the medium, and under pressure, and the solvent capacity of the medium is reduced in stages, e.g., by progressively cooling the mixture or by varying the concentration of the solvent, whereby the dissolved substances are caused to separate in fractions of increasing solubility. Dissolution of the raw material may be so effected as to leave the pitch or asphalt undissolved. By this treatment tars may be fractionated into pitch, oils of high paraffin wax content, lubricating oils, hydrocarbon oils free from wax and cresols, unsaturated hydrocarbons, and phenols. The fractions possess a high degree of purity, and require little further refining. A. B. MANNING.

Obtaining products from hydrocarbons by heat treatment. W. K. LEWIS and N. E. LOOMIS, ASSTS. to STANDARD OIL DEVELOPMENT CO. (U.S.P. 1,767,297, 24.6.30. Appl., 30.3.23).—A suitable heat-radiating material, e.g., refractory chequerwork, is heated by furnace gases and serves to radiate heat to a pipe coil which receives the feed oil. Connected to the pipe coil is another coil placed in another compartment, and not receiving radiant heat, but heated by the hot products of combustion which finally escape to the stack, the temperature of this zone being regulated by the return of cool combustion products thereto. H. S. GARLICK.

Conversion of hydrocarbons into hydrocarbons of lower mol. wt. J. Y. JOHNSON. From I. G. FARBEN-IND. A.-G. (B.P. 339,274, 30.5.29).—The initial

hydrocarbon material is subjected to cracking at a high temperature and under reduced, atmospheric, or increased pressure, in the presence of a catalyst. One or more pieces consisting wholly of silicon or of silicon deposited upon a carrier are suitable as catalysts.

H. S. GARLICK.

Cracking of hydrocarbon oils. W. W. TRIGGS. From PANHANDLE REFINING Co. (B.P. 339,291, 29.6.29). -The plant comprises a cracking still and a preheating still combined in one structural unit containing two separately fired chambers divided by a central refractory partition with an opening above, together with a stack having a flue opening into the preheating still chamber whereby the heated gases and products of combustion from the cracking still pass over the top of the separating partition, and, by down-draught, are drawn through the preheating still chamber before passing to the stack. Hydrocarbon oils are preheated and introduced into a vaporising zone. The vapours are passed through a separate, superheated, cracking zone at 540-650°, and into a series of heat-exchanging and fractionating zones where they pass in indirect countercurrent with fresh make-up oil. A portion of the condensate from one of the fractionating zones is passed back to a preceding zone and used as solvent means to remove heavier condensate therefrom, which, together with the condensed higher-boiling uncracked portions, is caused to absorb heat from the partly cracked vapours drawn from the cracking zone, and is returned to the flashing zone. The light condensate is removed, stripped of lighter products absorbed during condensation, and finally the desired low-boiling products are collected while the make-up oil, preheated to the point of vaporisation, is introduced into the system as vapour. (Cf. B.P. 337,380; B., 1931, 54.)

H. S. GARLICK.

Coking [heavy liquid hydrocarbons]. H. G. JENNISON and C. R. FABEN (U.S.P. 1,749,138, 4.3.30. Appl., 28.7.28).—Hot gases produced by the combustion of carbonaceous fuel are passed, under induced draft, through the tar, pitch, or petroleum residue, etc., which is contained in a metal chamber lined with refractory material, and the liquid hydrocarbons are thereby distilled to coke. The distillate is condensed and collected. When coking is practically complete air may be introduced into the heating gases in order to oxidise any residual hydrocarbons in the coke.

A. B. MANNING.

Cracking of [fuel] oil. G. EGLOFF, ASST. to UNIVER-SAL OIL PRODUCTS CO. (U.S.P. 1,766,331, 24.6.30. Appl., 6.12.20. Renewed 25.5.29).—A stream of charging oil is passed under pressure through a heating zone at a temperature sufficient to vaporise a substantial part thereof, and the heated hydrocarbons are introduced under a pressure in excess of that in the heating zone into an enlarged expansion chamber. The vapours are dephlegmated and the reflux condensate is separately heated to cracking temperature and passed under pressure to the expansion chamber, from which any unvaporised residual oil is withdrawn. H. S. GARLICK,

Treatment and purification of hydrocarbon oils. L. C. HUFF, Assr. to UNIVERSAL OIL PRODUCTS Co. (U.S.P. 1,751,862, 25.3.30. Appl., 15.11.23. Renewed 2.7.28).—Distillates from the pressure distillation of hydrocarbon oils are purified by a continuous process in which they are treated successively with plumbite, sulphuric acid, and caustic soda, each treatment being followed by water-washing. In each treatment the oil and reagent are introduced into a mixing chamber and passed thence to a settling chamber. The water-washing is carried out by causing the oil to flow through a confined zone countercurrent to a spray of water. Throughout the whole treatment the material is maintained under a pressure above atmospheric. A. B. MANNING.

Apparatus for cleansing [lubricating and other] oils. PRESTON, STALLARD & Co., LTD., and J. MALS-BURY (B.P. 337,981-2, 8.11.29).-(A) A hot-water circulating pipe is centrally disposed in a heat-insulated tank having a funnel-shaped lower portion connecting with an outlet pipe. An electric heater extends upwardly into the water-circulating pipe and is controlled by an adjustable electric delay-action time switch actuated by clockwork. Water is circulated through oil in the tank by thermosiphon means and brings about coagulation of the impurities which, on cooling of the oil, form a layer at the oil-water interface. (B) The upper portion only of the tank (i.e., that portion within which the oil collects) is surrounded by heat-insulating lagging. whilst the lower funnel-shaped portion, in which the water collects, is exposed to the atmosphere in order to accelerate cooling after the heater has been cut out.

H. S. GARLICK. Refining of liquid hydrocarbons. SILICA GEL CORP. (B.P. 311,285, 7.5.29, U.S., 8.5.28).-A liquid hydrocarbon has added to it sufficient of an acid (e.g., sulphuric acid) to react with only a portion of the gumforming constituents contained therein, and is then brought into contact with a solid absorbent (e.g., silica gel) at normal or raised temperatures (preferably at 121-149°). Alternatively, the hydrocarbon is brought into contact with a solid absorbent to which has been added a sufficient quantity of acid to react with only a portion of the gum-forming constituents. A sufficient superatmospheric pressure is maintained to keep the hydrocarbon in the liquid phase. The absorbent may be impregnated with one or more metallic oxides to facilitate removal of sulphur, and in place of sulphuric acids methyl sulphate or anhydrous aluminium chloride may H. S. GARLICK. be used.

Refining of liquid hydrocarbons. J. JOHNSON, JUN., Assr. to J. R. TOWNSEND (U.S.P. 1,766,338-9, 24.6.30. Appl., [A] 28.3.23, [B] 11.8.25. Renewed [A] 29.3.30, [B] 28.3.29).-(A) Crude hydrocarbon oil is mixed with 2-10% of acidified absorbent earth and distilled up to a coking temperature. The vapours are collected and condensed into the normal commercial products, which may be re-treated separately if desired. (B) By distilling crude liquid hydrocarbons, e.g., crude petroleum or shale oil, with a finely-powdered, acidified earth (95 pts. of absorbent clay or aluminium silicate and 3 pts. of sulphuric acid), the products carried off at the various customary temperatures will be practically pure gasoline, kerosene distillate, and lubricating oil stocks without any further treatment except a possible redistillation in the same manner. H. S. GARLICK.

Refining of petroleum and like hydrocarbons. W. W. TRIGGS. From PAN AMER. PETROLEUM Co. (B.P. 338,482-4, 7.5.29).-Distillates are refined by treatment with sulphur dioxide and sulphuric acid. In (A) lamp oil is cooled by heat exchange with cold treated oil and then by heat exchange with liquid sulphur dioxide to -8°. The oil is then passed upwards through two towers where it meets a countercurrent of liquid sulphur. dioxide. It is next treated in a similar tower with fuming sulphuric acid (>15% SO3), and then passed through heat exchangers and the sulphur dioxide removed by distillation under reduced pressure. The process is continuous. In (B) heavier distillates such as transformer oil are treated first with sulphur dioxide at below 0° and then with fuming sulphuric acid (15% oleum) in the presence of dissolved sulphur dioxide, at temperatures below 15°. The first extraction is carried out in a packed tower, the oil being passed upwards and refining agent run downwards over the packing material. In (c) distillates containing polymerisable hydrocarbons and sulphur compounds are mixed, after cooling to -8° in a heat exchanger with liquid sulphur dioxide, and the mixture is passed successively through two treating tanks where it is brought into contact with sulphuric acid  $(d \ 1.71-1.84)$  or, in the case of gasolines, cracked under 1000 lb. pressure with fuming sulphuric acid. After this treatment the oil is passed through the heat exchanger and the sulphur dioxide removed by heating under vacuum; the gas is also Т. А. Ѕмітн. recovered from the acid tar.

Stabilisation of crude petroleum. F. B. BIMEL, Assr. to STANDARD OIL DEVELOPMENT Co. (U.S.P. 1,767,341, 24.6.30. Appl., 19.8.26).—Crude petroleum from the wells passes under reduced pressure through a preheater, where it is raised to a temperature not above 150°, into a rectifier from which liquid and gas containing vapour are separately removed. The gas is compressed to recover normally liquid constituents and the condensate is returned to the cooled oil flowing from the rectifier.

H. S. GARLICK.

Refining the hydrocarbons of mineral oils. W. W. GROVES. From ALLGEM. GES. F. CHEM. IND. (B.P. 338,579, 22.7.29).—The whole of the distillate up to 400°, except the benzine portion, obtained from mineral oil is treated with liquid sulphur dioxide instead of treating fractions as is the usual practice. This method enables the lubricating portion to be refined more easily than when a special lubricating oil cut is treated with the refining agent. The benzine portion is removed owing to the difficulty in separating it by distillation from liquid sulphur dioxide. The distillate from Persian crude oil is treated with 150% of the liquid sulphur dioxide. The products are 25% of extract (d 0.933) and 75% of refined oil (d 0.895). T. A. SMITH.

Fractional extraction of petroleum hydrocarbons with alcohol. T. A. WERKENTHIN, ASST. to SOLAR REFINING Co. (U.S.P. 1,766,768, 24.6.30. Appl., 30.12.27).—Topped crude oil, wax-bearing distillate or residue, heavy residual fuel oil, spent lubricating oil, or heavy residual oil from cracking may be pumped through a heat exchanger into a mixing coil where it is mixed with alcohol that has been similarly preheated

to a temperature below its b.p. The dissolved oil extract and undissolved oil is run into a settling tank where most of the undissolved oil settles out, the oil extract overflowing into a centrifugal separator where the last traces of undissolved oil are removed. The extract is then forced into a still where the alcohol is removed, the vapours passing through a dehydrator or by-pass line into the heat exchangers and condenser, the condensate being subsequently collected in a storage tank and re-circulated through the system. The undissolved oil collected in the bottom of the settling tank and separated by the centrifuge, from which "cracking stock" has been removed, undergoes a similar process of extraction in a second unit where the light lubricating components are extracted. Third and fourth units serve to extract in a similar manner the medium and heavy oil fractions, whilst the final undissolved material remains as an asphaltic residuum. Where the original oils were wax-bearing, the treatment produces a series of lubricating oils containing waxes notable for their good crystallising properties and ready removal from the oils.

H. S. GARLICK.

Manufacture of oxidation products of highmolecular hydrocarbons, waxes, etc. J. Y. JOHNSON. From I. G. FARBENIND, A.-G. (B.P. 337,130, 12.9.29).— In the utilisation of the heat of reaction by heat exchange which consists in injecting a spray or mist into the cooling jacket, the amount of spray has hitherto been adjusted so as to secure its complete evaporation. It is advantageous to have in contact with the reaction vessel in the cooling jacket a quantity of cooling liquid in addition to the spray or mist, so that sudden evolution of heat may be dealt with. C. HOLLINS.

Deoxidiser for insulating oils. C. J. RODMAN and A. H. MAUDE, Assr. to WESTINGHOUSE ELECTRIC & MANUFG. Co. (U.S.P. 1,736,464, 19.11.29. Appl., 20.7.23). —A device for preventing oxidation of insulating oil comprises a container with a lateral inlet near the base and a pipe at the top leading to the upper part of the oil tank. In the container are two concentric gauze cylinders, the intermediate space being filled with a mixture of sodium thiosulphate and sodium bicarbonate. Air entering at the bottom of the container passes through this mixture and is deprived of its oxygen, so that a mixture of carbon dioxide and nitrogen is introduced into the space above the oil. W. J. WRIGHT.

Motor spirits. L. W. E. TOWNSEND and A. RICH-MOND (B.P. 338,581, 23.7.29).—High-boiling shale oil (230—360°) is cracked at high temperature, the tar portion of the condensate being dehydrated in a stream of carbon dioxide at 120°. The pressure is then reduced to 2 mm. and the distillate collected separately. The additon of 1—5% of this oil to petrol allows a considerable addition of paraffin oil to be made without impairing the anti-knock value of the spirit. T. A. SMITH.

Internal-combustion engine fuel. I. BOURDE (U.S.P. 1,752,724, 1.4.30. Appl., 4.3.26).—Denatured alcohol in relatively small proportions (e.g., 1 oz. per 10—15 gals.) is mixed with gasoline or crude oil.

H. ROYAL-DAWSON.

Processing of coal and product thereof. Powdered coke product. W. RUNGE, Assr. to INTERNAT. COAL

CARBONISATION Co. (U.S.P. 1,783,982—3, 9.12.30. Appl., 12.6.25).—See B.P. 253,498—9; B., 1927, 34, 99.

Dehydration of moist [solid] fuels. H. A. VON STADEN and A. HOEHN, ASSTS. to I. G. FARBENIND, A.-G. (U.S.P. 1,783,757, 2.12.30, Appl., 23.10.28, Ger., 14.12.27).—See B.P. 317,771; B., 1929, 885.

Fuel briquette. J. S. FORD and F. MURRAY (U.S.P. 1,784,665, 9.12.30. Appl., 6.3.29. N. Zealand, 30.11.28). —See B.P. 329,437; B., 1930, 803.

Carbonising apparatus. O. H. HERTEL, Assr. to OLD BEN COAL CORP. (U.S.P. 1,783,190, 2.12.30, Appl., 7.5.25).—See B.P. 249,710; B., 1926, 429.

Manufacture of active carbon. J. VAN LOON (U.S.P. 1,782,493, 25.11.30. Appl., 15.2.27. Holl., 5.3.26).— See B.P. 292,213; B., 1928, 631.

Manufacture of activated carbon. R. DEFRIS and R. WÄLDER (U.S.P. 1,783,110, 25.11.30. Appl., 27.2.28. Austr., 3.3.27).—See B.P. 303,669; B., 1929, 195.

Elimination of sulphur compounds from gases. G. WIETZEL, J. JANNEK, and F. FRIED, ASSTS. to I. G. FARBENIND. A.-G. (U.S.P. 1,782,590, 25.11.30. Appl., 29.3.28. Ger., 8.4.27).—See B.P. 319,396; B., 1929, 969.

Cracking of hydrocarbons. G. C. HARGROVE and W. B. MONTGOMERY, Assis. to GASOLINE PRODUCTS Co. (U.S.P. 1,784,065, 9.12.30. Appl., 20.12.27).—See B.P. 290,996; B., 1929, 120.

[Machines for] manufacture of briquettes. W., V., and W. J. BOOTH (B.P. 339,868, 6.2.30).

Pulverised fuel burners for locomotive and other furnaces. R. ROOSEN (B.P. 339,901, 12.3.30. Ger., 22.3.29).

Continuous distillation (U.S.P. 1,756,032). Adsorbent materials (U.S.P. 1,752,721). Distributors for gases carrying solids (B.P. 338,327). Treatment of exhaust gases (B.P. 338,933).—See I. Acetylene and hydrogen (B.P. 337,088). Absorption of olefines (B.P. 336,633 and 336,603—4).—See III. Solvent extraction of wood (U.S.P. 1,762,785). —See V. Waterproof cement (U.S.P. 1,762,785). —See V. Waterproof cement (U.S.P. 1,755,638). Waterproof board (B.P. 319,213). Paving material (U.S.P. 1,767,830). Surfacing roads etc. (B.P. 338,206). Materials for road construction etc. (B.P. 337,521).—See IX. Sucker rod [for oil pumps] (U.S.P. 1,764,068).—See X. Rubber dispersions (B.P. 315,839).—See XIV.

## III.—ORGANIC INTERMEDIATES.

See A., Jan., 60, Condensation of hydrocarbons by electrical discharge (LIND and GLOCKLER). 61, Preparations of anhydrous alcohol (ADICKES). 78, Behaviour of benzenoid hydrocarbons in the Tesla discharge (AUSTIN and BLACK) 81, Purification of phenanthrene (COHEN and CORMIER). Acenaphthene series (MORGAN and HARRISON). 84,  $\beta$ -Naphthol-3sulphonic acid (HOLT and MASON). 87, Di- and triarylamine derivatives (JOSZT and LESNIANSKI).

#### PATENTS.

Manufacture of acetylene and hydrogen in the electric arc. J. Y. JOHNSON. From I. G. FARBENIND. A.-G. (B.P. 337,088, 7.8.29).—Dilute hydrocarbon gases, e.g., waste gas from coal hydrogenation, are passed through a series of arcs (acetylene being removed after each) of increasing lengths, e.g., in the ratio  $2 \cdot 8 : 4 : 5$ . Suitable apparatus is described. C. HOLLINS.

Manufacture of ethylene [from acetylene]. J. Y. JOHNSON. From I. G. FARBENIND. A.-G. (B.P. 336,999, 24.5.29).—In the hydrogenation of acetylene to ethylene a catalyst of compact tellurium at 450° or sheet nickel at 180° minimises the production of ethane even with excess of hydrogen. C. HOLLINS.

Absorption of (A, B) ethylene by means of sulphuric acid, (c) olefines having three or more carbon atoms in the molecule by means of sulphuric acid, phosphoric acid, or concentrated sulphonic acids, and (A, C) manufacture of the corresponding esters, ethers, alcohols, or other compounds. H. D. ELKINGTON. From N.V. DE BATAAFSCHE PETROLEUM MAATS. (B.P. 336,633, 336,603 -4, 4.6.29).—As ethylene absorption catalysts there are employed metals of the platinum group (A) in finelydivided condition, preferably on a carrier; (B) in soluble form, with or without addition of compounds of copper, iron, cobalt, or nickel, preferably either or both series of metal compounds being converted into soluble complex compounds by passing carbon monoxide or nitric oxide through the acid mixture. (c) Method (B) is extended to higher olefines, and soluble complex compounds may also be prepared by using ethylene in place of carbon monoxide or nitric acid. The absorbent for the higher olefines may be sulphuric acid, phosphoric acid, or benzenesulphonic acid. C. HOLLINS.

**Polymerisation of diolefines.** J. Y. JOHNSON. From I. G. FARBENIND. A.-G. (B.P. 337,019, 25.5.29).— In the polymerisation of diolefines with sodium etc., soluble plastic products are obtained by continuously removing the soluble products as formed by means of a solvent (light petroleum, ether, benzene, *cyclohexane*); *e.g.*, solvent is distilled into and through the polymerisation vessel as in a Soxhlet apparatus. C. HOLLINS.

Manufacture of aliphatic [acetic] anhydrides. H. DREVFUS (B.P. 336,668 and 336,960, [A] 19.7.29, [B] 22.7.29).—(A) Asbestos is used as a carrier for catalysts in the conversion of acetic acid into anhydride by heat. (B) For the conversion of acetic and other aliphatic acids into anhydrides at 350—700°, oxides or acids of arsenic or antimony, or salts of these, are used as catalysts. C. HOLLINS.

Catalytic manufacture of synthetic acetic acid. Soc. FRANÇ. DE CATALYSE GÉNÉRALISÉE (B.P. 338,329, 27.7.29. Fr., 26.1.29).—Carbon monoxide is hydrogenated in the presence, as catalysts, of one or more of the phosphates, silicates, or borates of nickel, cobalt, chromium, iron, and copper, with or without any other metals, oxides, carbonates, or other salts. The reaction is effected at 500—550°/450—600 atm.

H. ROYAL-DAWSON.

Manufacture of oxygenated organic compounds [from carbon oxides and hydrogen]. H. DREYFUS (B.P. 337,014, 24.7.29).—The use of catalysts comprising ferrites, ferrates, cobaltites, or cobaltates of alkalineearth metals at  $250-350^{\circ}/50-200$  atm. leads to production of ethyl alcohol. The gas mixture may be replaced wholly or in part by methyl or higher alcohols produced by hydrogenation of carbon oxides.

C. HOLLINS.

Manufacture of butyl alcohol [from ethyl alcohol]. H. D. ELKINGTON. From N.V. DE BATAAFSCHE PETROL-EUM MAATS. (B.P. 336,811, 17.2.30).—Ethyl alcohol is heated with magnesium and copper oxides (3:2 or 4:1) in an autoclave at 270°/130—140 atm. or 325°/200—300 atm., so that the alcohol is present only as vapour. A 30% conversion into butyl alcohol takes place in 2 hrs. C. HOLLINS.

Manufacture of tetrahydrofurfuryl alcohol. IMPERIAL CHEM. INDUSTRIES, LTD. From E. I. DU PONT DE NEMOURS & Co. (B.P. 337,296, 25.1.30).—Furfuraldehyde is heated with hydrogen at 50—150°/6·5—120 atm. in presence of reduced nickel; 5—15% of water may be present. C. HOLLINS.

Manufacture of aliphatic acids and their esters [from carbon monoxide and alcohols]. BRIT. CELANESE, LTD., and W. BADER (B.P. 337,053, 27.7.29). —Carbon monoxide is passed into the "liquid " (methyl) alcohol containing an inorganic acid catalyst (phosphoric acids, preferably partly esterified with the alcohol) at 300—400°/100—300 atm. The use of aqueous alcohol (40—80%) or addition of steam is advantageous. Thus methyl alcohol is mixed with phosphoric acid at 60—90° and injected into a heated reaction vessel through which carbon monoxide and steam are passed under pressure. The products pass through a separator at 150—200° where phosphoric acid is returned to the mixer, to a condenser, and after removal of acetic acid and methyl acetate the carbon monoxide is recirculated. C. HOLLINS.

Manufacture of dialkyl sulphates [methyl sulphate]. ETABL. LAMBIOTTE FRÈRES (B.P. 336,681, 22.7.29. Fr., 25.6.29).—Dimethyl ether (or other dialkyl ether) is absorbed in 60% oleum at 30°, and the product is distilled. Preferably equimolecular proportions are employed, and the sulphuric acid left after distillation is used for the preparation of more ether from alcohol. C. HOLLINS.

Manufacture of pure glycerin. J. Y. JOHNSON. From I. G. FARBENIND. A.-G. (B.P. 336,608, 12.7.29).— A "mist" comprising air or other carrier and a finelydivided liquid having a b.p. not above that of water is led at 15—30 mm. pressure into crude concentrated glycerin at its b.p.; the distillate is pure enough for nitration. Thus 82% crude glycerin from spent soap lye is heated at 160—180°/30 mm. and wet steam at 60° is led in ; or a mist of carbon tetrachloride or benzene in air or carbon dioxide at 5° is passed into crude glycerin at 180°/20 mm., the condensate being collected at 110°.

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Manufacture of lecithin preparations. ORANIEN-BURGER CHEM. FABR. A.-G. (B.P. 317,730, 19.8.29. Ger., 20.8.28).—Preparations for leather dressing etc. are made by dissolving lecithin and an emulsifying agent in a water-miscible solvent, with or without addition of oil; e.g., evaporated milk, glycerin, soya-bean lecithin, and water; lecithin, glycerol monochlorohydrin, neatsfoot oil, sulphonated neatsfoot oil, and Marseilles soap; lecithin, glycerin, and egg-yolk (with flour and alum for tanning glacé leather). C. HOLLINS.

Manufacture of polyhalogenated fatty acids. A. CARPMAEL. From I. G. FARBENIND. A.-G. (B.P. 336,623, 15.7.29).—A fatty acid above  $C_8$  is treated with chlorine or bromine or a mixture of chlorate and hydrochloric acid in such amount as to give a trihalogenated acid; in the case of unsaturated acids at least one halogen must be introduced by substitution. Ricinoleic acid gives products containing 3, 6, 7, or 16 atoms of chlorine; oleic acid takes up 3 or 4, stearic acid 6, and dihydroxystearic acid 5 atoms of chlorine. The products are colourless oils or sticky plastic solids and are useful as dyeing assistants. C. HOLLINS.

Manufacture of (A, B) hydroaromatic hydrocarbons and (A) derivatives thereof. J. Y. JOHNSON. From I. G. FARBENIND. A.-G. (B.P. 336,583 and 336,616, [A] 10.7.29, [B] 17.4.29).-(A) Aromatic or partly hydrogenated aromatic hydrocarbons, or (B) phenols, are converted into hydroaromatic hydrocarbons by hydrogenation at pressures above 100 atm. and at temperatures (A) below 350°, (B) between 250° and 400°, in presence of catalysts immune from sulphur poisoning, viz., oxides or sulphides of metals of groups II-VII mixed with heavy metals of group I or VIII either as metals, oxides, or sulphides. (A) Derivatives of the aromatic hydrocarbons, such as phenols, amines, etc., are reduced also, but temperatures above 260° must be avoided if the substituent groups are to be retained. Examples are: (A) benzene over platinum and tungsten sulphides at 320°/200 atm. for cyclohexane; liquid naphthalene over nickel and molybdenum oxides and calcium carbonate on active charcoal at 300°/150 atm. for tetrahydronaphthalene; anthracene in an autoclave with cobalt and molybdenum sulphides on Florida earth at 220°/100 atm. for octa-, deca-, and dodecahydroanthracene; (B) phenol with cobalt and molybdenum sulphides on active carbon at 270-300°/150 atm. for cyclohexane; crude cresol with nickel and molybdenum sulphides on Florida earth at 300-350°/150 atm.; a-naphthol pitch with cobalt-aluminium-zinc oxides at  $320^{\circ}/150$  atm. for hydrogenated naphthalenes;  $\beta$ naphthol with nickel and tungsten sulphides on active silica at 250-270°/150 atm. for tetra- and deca-hydronaphthalenes. C. HOLLINS.

Manufacture of 1-chloromethylnaphthalene. I. G. FARBENIND A.-G. (B.P. 337,289, 11.1.30. Ger., 12.1.29). —Hydrogen chloride is led into a mixture of naphthalene, aqueous formaldehyde, and hydrochloric acid at 60—65° for 10 hrs. Distillation of the separated oil affords 1-chloromethylnaphthalene, m.p. 31—32°, b.p. 153°/12 mm. (yield 83%, conversion 61%). C. HOLLINS.

Manufacture of condensation products of the naphthalene series [1:4- and 1:5-naphthalenedicarboxylic bishydroxyarylamides]. W. W. GROVES. From I. G. FARBENIND. A.-G. (B.P. 336,800, 18.10.29).—Naphthalene-1:4- or -1:5-dicarboxylic dichloride is condensed with an aminophenol having at least one of the positions 2, 4, and 6 free. Products from the 1:5-acid chloride with *m*-aminophenol (m.p.



295—298°), p-aminophenol (m.p. 325—330°), 2-amino-pcresol (m.p. 190—193°), and 1:7-aminonaphthol, and from the 1:4-acid chloride with m-aminophenol (m.p. 270—273°) and 1:4- and 1:7-aminonaphthols, are described. The products are suitable for coupling on the fibre for ice colours. C. HOLLINS.

Production of dye intermediates [of the dianthraquinonyl series]. W. SMITH, J. THOMAS, and SCOTTISH DVES, LTD. (B.P. 336,982, 16.4.29).—An anthraquinone carrying a halogen or diazo group in position 1 and chlorine, bromine, or a sulphonic group in position 2 is treated with copper to give 1:1'-dianthraquinonyls. The 2:2'-dichloro- (m.p. above 300°), 2:2'-dibromo-, and 2:2'-disulpho-derivatives are described.

C. HOLLINS.

Manufacture of acetic acid. H. DREYFUS (U.S.P. 1,784,583, 9.12.30. Appl., 22.10.26. U.K., 7.11.25).— See B.P. 268,845; B., 1927, 521.

Ethyl alcohol gel. H. OHLE and J. OTHMAR-NEUSCHELLER (U.S.P. 1,783,133, 25.11.30. Appl., 15.11.27. Ger., 30.11.26).—See B.P. 281,662; B., 1929, 315.

Manufacture of urea. H. C. HETHERINGTON and H. J. KRASE, ASSTS. to A. B. LAMB (U.S.P. 1,782,723, 25.11.30. Appl., 2.3.26).—See B.P. 335,913; B., 1931, 12.

Manufacture of aromatic hydroxyaldehydes. G. REDDELEIN, H. LANGE, and H. PFANNENSTIEL, ASSIS. to WINTHROP CHEM. Co., INC. (U.S.P. 1,783,584, 2.12.30. Appl., 27.6.28. Ger., 30.7.27).—See B.P. 284,889; B., 1929, 276.

Catalytic hydrogenation of aromatic aminocompounds. F. KLINGEMANN, W. LOMMEL, E. KORTEN, and T. GOOST, ASSIS, to I. G. FARBENIND. A.-G. (U.S.P. 1,782,729, 25.11.30. Appl., 2.10.26. Ger., 10.10.25).— See B.P. 300,285; B., 1929, 350.

Production of (A) thymol, (B) phenols. H. JORDAN, W. SCHOELLER, and R. CLERC, ASSTS. to CHEM. FABR. AUF AKT. (VORM. E. SCHERING) (U.S.P. 1,784,598—9, 9.12.30. Appl., 15.8.27. Ger., [A] 22.2.27, [B] 16.11.26).—See B.P. 285,833 and 280,924; B., 1929, 699, 237.

Production of alkylated phenols. H. JORDAN, Assr. to CHEM. FABR. AUF AKT. (VORM. E. SCHERING) (U.S.P. 1,782,966, 25.11.30. Appl., 12.7.26. Ger., 4.7.25).— See B.P. 254,753; B., 1928, 740.

Production of products of hydrogenation of alkylated phenols. H. JORDAN, ASST. to CHEM. FABR. AUF AKT. (VORM. E. SCHERING) (U.S.P. 1,782,621. 25.11.30. Appl., 12.7.26. Ger., 4.7.25).—See B.P. 254,753; B., 1928, 740.

Recovery of cresol from aqueous solutions of same. H. SUIDA (U.S.P. 1,784,711, 9.12.30. Appl., 6.7.26. Austr., 13.7.25).—See B.P. 255,047; B., 1927, 316.

Manufacture of aminonaphthol ethers. A. ZITSCHER, ASST. to GEN. ANILINE WORKS, INC. (U.S.P. 1,784,408, 9.12.30. Appl., 16.12.27. Ger., 3.1.27).—See B.P. 304,441; B., 1929, 276.

Splitting off sulpho-groups from anthraquinonesulphonic acid derivatives. R. E. SCHMIDT, ASST. to GEN. ANILINE WORKS, INC. (U.S.P. 1,782,747, 25.11.30.

Appl., 13.4.26. Ger., 17.4.25).—See B.P. 250,968; B., 1927, 743.

Oxidation products of high-molecular hydrocarbons etc. (B.P. 337,130).—See II. Vat dye intermediates (B.P. 336,983). Naphthazarin derivatives (B.P. 316,950).—See IV. Wetting etc. agents (U.S.P. 1,750,198).—See VI. Fungicide (U.S.P. 1,760,000).—See XVI. Acetylmethylcarbinol and diacetyl (B.P. 337,025).—See XVIII. tert.-Aminoalkyl aminoalkoxybenzoates (B.P. 317,296).—See XX.

## IV.—DYESTUFFS.

See A., Jan., 37, Congo-acid sols (TANAKA). 58, Colorimetry without comparative standards (Hock and MÜLLER). 75, Purely aliphatic streptopentamethine dyes (König and REGNER). 82, Colours of substituted benzeneazophenols, including o-azophenols (Hodgson and Rosenberg). 84, B-Naphthol-3-sulphonic acid (HOLT and MASON). Colour reactions of certain diamino- and nitroamino-diphenylmono- and -di-sulphides (Hodgson and Rosenberg). 87, Di- and tri-arylamine derivatives (Joszt and LESNIANSKI). 89, Chlorophenol-red (HARDEN). 96, Preparation of tetraethyldiaminodiphenylfurylmethyl chloride (MAHOOD and ALDRICH). 99, Diazotisation in the pyrazole series (REILLY and MAC-100, SWEENEY). Bis-5-phenyl-2-pyrroleindigo (MADELUNG and UBERMANN). 103, Preparation of thiocyanine dyes (FISHER and HAMER).

## PATENTS.

Manufacture of [vat] dyes and [vat] dye intermediates [of the anthraquinone series]. W. SMITH, L. J. HOOLEY, and SCOTTISH DYES, LTD. (B.P. 336,983, 16.4.29).—The chlorine etc. in 2 : 2'-dichloro-, -dibromo-, or -disulpho-1 : 1'-dianthraquinonyl is replaced by hydroxyl, thiol (and disulphido-), imino-, amino-, substituted amino-, or aryloxy-groups by heating with metal hydroxides, sulphides, mercaptans, ammonia, amines, or phenols, especially in presence' of copper salts. Ammonia, copper sulphate, and pyridine at 180° give flavanthrone. Products from aniline, sodium sulphide, calcium hydroxide, methylamine, aniline, 1-aminoanthraquinone, and phenol are also described.

C. HOLLINS.

Manufacture of derivatives of naphthazarin. I. G. FARBENIND. A.-G. (B.P. 316,950, 6.8.29. Ger., 4.8.28).—Formaldehyde (or other aliphatic aldehyde) is added to the blue solution ("naphthazarin intermediate") obtained by reduction of 1 : 8- or 1 : 5-dinitronaphthalene in sulphuric acid. A black product is precipitated, which is useful as pigment for oil paints or lacquers, as a spirit dye, and in the wallpaper and stained paper industry. C. HOLLINS.

Manufacture of chlorination products of isodibenzanthrone and their application. A. G. BLOXAM. From Soc. CHEM. IND. IN BASLE (B.P. 336,775, 3.10.29). —Vat dyes which are insensitive to water are obtained by chlorinating *iso*dibenzanthrone in presence of a halogen carrier (antimony pentachloride, iodine, ferric chloride) so as to introduce more than 2 chlorine atoms; *e.g.*, with antimony pentachloride (3 pts.) in nitro-

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benzene at 190-200°, or with sulphuryl chloride (or chlorine) and iodine in nitrobenzene at 100-105°, or with ferric chloride (6 pts.) in trichlorobenzene at 140-150°. C. HOLLINS.

Purification of vat dyes of the anthanthrone series. I. G. FARBENIND. A.-G. (B.P. 316,149, 23.7.29. Ger., 23.7.28).—Halogenated anthanthrones are purified by grinding with 80—95% sulphuric acid or by diluting their solution in sulphuric acid to that concentration. In each case an insoluble (oxonium ?) sulphate, readily hydrolysed by water, is formed and impurities remain in solution. C. HOLLINS.

Manufacture of azo dyes [pigments and ice colours]. W. W. GROVES. From I. G. FARBENIND. A.-G. (B.P. 336,938, 10.7.29) .- Non-sulphonated and non-carboxylated diazo, tetrazo, or diazoazo compounds are coupled in substance or on the fibre with 2: 3-hydroxynaphthoic 4-alkoxy-2- or -3-methylanilides. Increased fastness to light due to the presence of the methyl group is claimed. Examples are: 6-methoxym-toluidide with diazotised 4-chloro-o-toluidine (red), m-xylidine (red), m-chloroaniline (scarlet), 2:5-dichloroaniline (brown-red), m-nitroaniline (orange-brown), p-nitroaniline  $\rightarrow 2:5$ -dimethoxyaniline (blue-black), o-phenetidine  $\rightarrow \alpha$ -naphthylamine (red-black); 5methoxy-o-toluidide with diazotised 5-chloro-o-toluidine (blue-red), 2:4-dichloroaniline (dark red), 1-aminoanthraquinone (brown-red), dianisidine (coppered, dark blue). Other coupling components are the 5-ethoxyand 5-butoxy-o-toluidides. C. HOLLINS.

Manufacture of direct-dyeing disazo dyes. J. R. GEIGY A.-G. (B.P. 337,224, 15.11.29. Ger., 15.11.28).— 3:3'-Diamino-4: 4'-dihydroxydiphenylsulphone or its nuclear methyl or halogen derivatives are tetrazotised and coupled with 2 mols. of an aryl-J-acid. The dyes give, in presence of copper salts, violet shades on cotton. C. HOLLINS.

Manufacture of [acid] azo dyes [for wool]. A. CARPMAEL, From I. G. FARBENIND. A.-G. (B.P. 336,580, 14.6.29).—Milling dyes for wool are obtained by coupling a diazotised aniline, carrying in position 2 either hydrogen, halogen, alkyl, or alkoxyl, and in position 4 a hydroaromatic residue, with a sulphonated coupling component. Examples are: 4-amino-2': 3': 4': 5'-tetrahydrodiphenyl  $\rightarrow$  F-acid (red), G-acid (blue-red), toluene-p-sulphonyl-K-acid (claret), or H-acid  $\leftarrow$ p-nitroaniline (green-blue); 4-amino-3-methoxy-1':2': 3': 4': 5': 6'-hexahydrodiphenyl  $\rightarrow$  N.W.-acid (red), G-acid (blue-red), H-acid (red-violet), 4-amino-1': 2': 3': 4': 5': 6'-hexahydrodiphenyl  $\rightarrow 1$ -p-sulphophenyl-3-methyl-5-pyrazolone (yellow), etc. Other first components are: 4-amino-3-methylhexahydrodiphenyl, 4amino-3- or -4'-methyl-2': 3': 4': 5'-tetrahydrodiphenyl, 4-amino-3-chloro- or -methoxy-2': 3': 4': 5'-tetrahydrodiphenyl. C. Hollins.

Manufacture of substantive-dyeing o-carboxyazo dyes containing copper. A. CARPMAEL, From I. G. FARBENIND, A.-G. (B.P. 336,971, 22.7.29).—Benzidine-3:3'-dicarboxylic acid is tetrazotised and coupled with 2 mols. of aminonaphtholdisulphonic acids (containing no N-substituent) and the resulting dye is coppered. The copper (other than a cuprammonium) salt may be added during coupling. Examples of coupling components are: 2S-acid (green-blue), H-acid (green-blue), K-acid (blue), 2:8:3:6-aminonaphtholdisulphonic acid (grey; developed with *m*-phenylenediamine, grey, or  $\beta$ -naphthol, blue-grey), and 2S- and H-acids (blue).

C. HOLLINS.

Manufacture of o-hydroxyazo dyes containing chromium. A. CARPMAEL. From I. G. FARBENIND. A.-G. (B.P. 316,268, 26.7.29).—The dyes of B.P. 2956 of 1912 (B., 1912, 1072), or their deacylated products also obtainable by coupling a diazotised o-aminophenolsulphonic acid with 1:7-aminonaphthol, are prechromed. [Stat. ref.] C. HOLLINS.

Manufacture of azo dyes [containing metal]. Soc. CHEM. IND. IN BASLE (B.P. 315,400, 21.6.29. Switz., 13.7.28).—An o-hydroxy- or o-carboxy-diazo compound is coupled with J-acid,  $\gamma$ -acid, or 2:5-aminonaphthol-1:7-disulphonic acid, with or without a middle component; the product is then treated with a metal compound and an oxidising agent in either order. Examples are: 4-chloro-o-aminophenol-6-sulphonic acid  $\rightarrow$  J-acid, coppered, and oxidised with air, ferricyanide, persulphate, etc. (grey on cotton or viscose silk); 1: 2: 4-aminonaphtholsulphonic acid  $\rightarrow$  J-acid, chromed, and oxidised with hypochlorite (green on wool or silk); o-aminophenol-4: 6-disulphonic acid  $\rightarrow$ J-acid, coppered, and oxidised with dichromate (grev on wool or silk); 4-nitro-o-aminophenol-6-sulphonic acid  $\rightarrow$  J-acid, oxidised with hypochlorite, and coppered (greenish-grey); 4-chloro-o-aminophenol-6sulphonic acid  $\rightarrow$  J-acid  $\rightarrow$  J-acid, coppered, and C. HOLLINS. oxidised (grey).

Manufacture of [direct] azo dyes containing copper. Soc. CHEM. IND. IN BASLE (B.P. 315,664 and Addn. B.P. 315,665, 15.7.29. Switz., 14.7.28).—(A) A J-acid derivative of the type  $[C_{10}H_5(OH)(SO_3H)\cdot NH\cdot]_2X$ , where X is carbonyl, thiocarbonyl, or a heterocyclic residue (triazine, quinazoline, pyrimidine, etc.), is coupled alkaline with 2 mols. of a diazotised anthranilic acid or ester, or with 1 mol. of this and 1 mol. of a diazotised o-aminophenol, and the resulting dye is coppered in substance or on the fibre. (B) A J-acid derivative  $C_{10}H_5(OH)(SO_3H) \cdot NH \cdot X \cdot NH \cdot Ar \cdot N : N \cdot Ar'$ , where Ar is an aromatic residue and Ar' is a salicylic acid residue, is coupled in alkaline solution with a diazotised anthranilic acid or ester, and the dye is coppered as before. Examples are: (A) anthranilic acid or methyl anthranilate (2 mols.) -> carbonyl-Jacid (coppered, red-brown on cotton); anthranilic acid  $\rightarrow$  carbonyl-J-acid  $\leftarrow$  o-aminophenol-4-sulphonic acid (coppered, bordeaux-red) ; anthranilic acid (2 mols.)  $\rightarrow$  product from cyanuric chloride, J-acid (2 mols.), and aniline (1 mol.) (coppered, red-brown); (B) 5-sulphoanthranilic acid  $\rightarrow$  product of phosgenation of a mixture of J-acid and 4-amino-4'-hydroxyazobenzene-3'-carboxylic acid (coppered, yellow-brown).

C. HOLLINS.

[Direct] disazo dyes [for cotton]. W. W. TRIGGS. From E. I. DU PONT DE NEMOURS & Co. (B.P. 336,646, 12.7.29. Cf. U.S.P. 1,724,660; B., 1929, 974).—Direct orange to brown dyes are obtained by diazotising a nonsulphonated, non-carboxylated arylamine and coupling

through an aminobenzamidobenzoyl-J-acid as middle component with a sulphoaryl- or carboxyaryl-pyrazolone or a sulphonated or carboxylated indole. Examples are : aniline, *m*-xylidine, or  $\alpha$ -naphthylamine  $\rightarrow 4$ -*p*-aminobenzamidobenzoyl-J-acid  $\rightarrow 1$ -*p*-sulphophenyl-3-methyl-5-pyrazolone or 2-methylindole-6-sulphonic acid.

## C. HOLLINS.

Manufacture of a green vat dye from 1:12perylenequinone. W. PENECKE, ASST. to F. BENSA (U.S.P. 1,783,137, 25.11.30. Appl., 5.1.28. Austr., 19.11.27).—See B.P. 300,922; B., 1930, 95.

[Manufacture of an] isatin-carbazole compound vat dye. M. P. SCHMIDT and O. LIMPACH, Assrs. to GEN. ANILINE WORKS, INC. (U.S.P. 1,783,588, 2.12.30. Appl., 8.7.29. Ger., 21.7.28).—See B.P. 316,099; B., 1930, 1060.

Trimethylthionaphthen vat dyes. E. HOFFA and H. HEYNA, Assrs. to GEN. ANILINE WORKS, INC. (U.S.P. 1,782,724, 25.11.30. Appl., 30.3.28. Ger., 11.4.27).— See B.P. 288,554; B., 1929, 808.

[Manufacture of] anthraquinonethioxanthone vat dyes. A. LÜTTRINGHAUS and F. KAČER, ASSTS. to GEN. ANILINE WORKS, INC. (U.S.P. 1,783,659, 2.12.30. Appl., 6.3.28. Ger., 10.3.27).—See B.P. 290,408; B., 1928, 667.

Azo dyes. E. FELLMER, Assr. to GEN. ANILINE WORKS, INC. (U.S.P. 1,784,343, 9.12.30. Appl., 25.2.28. Ger., 17.8.22).—See G.P. 411,467; B., 1925, 624.

Manufacture of [azo] dyes containing metals. H. GUBLER, G. DE MONTMOLLIN, and J. SPIELER, Assrs. to Soc. CHEM. IND. IN BASLE (U.S.P. 1,783,083-4, 25.11.30. Appl., 9.7.29. Switz., 14.7.28).—See B.P. 315,664-5; preceding.

Condensation products of the naphthalene series. (B.P. 336,800).—See III.

## V.—FIBRES; TEXTILES; CELLULOSE; PAPER.

Moisture relations of cotton. VII. Hysteresis. A. R. URQUHART and N. ECKERSALL (J. Text. Inst., 1930, 21, T 499-510. Cf. Urguhart and Williams, B., 1926, 186; also A., 1929, 1140).-Absorption and desorption curves are merely boundaries of an equilibrium area, any point on which may be capable of representing the moisture regain of a sample of cotton under suitable conditions of humidity and pre-history. This is of importance in textile testing, since fixing the temperature and relative humidity at constant values may not be sufficient to ensure comparable conditions, and additional precautions may have to be taken if large differences of pre-history are possible. The desorption curve above 80% R.H. is itself indefinite, in that it varies with the amount of water previously in the cotton at the saturation point, but a definite curve can be obtained by removing water from cotton containing at least 40% of water. This aspect of the phenomenon must be considered when comparisons at high humidities are made. Cotton taken direct from the boll, or while still wet after kier-boiling or mercerising, is found to have an exceptionally high adsorptive capacity, and this is almost certainly accompanied by a high degree of swelling of cotton. Knowledge of this might prove of

advantage in subsequent processing. For example, kier-boiled and mercerised cloth dyed with direct sulphur, and vat dyes without previous drying gives darker shades and "brighter" hues than the same material air-dried or partly dried. B. P. RIDGE.

Porosity; a primary property of textiles. I. Milling of wool fabrics. II. Thickness of cloths. J. SCHOFIELD (J. Soc. Dyers and Col., 1930, 46, 368—372, 372—375).—I. Increase in thickness in regard to the milling of woollen fabrics has been investigated. In the acid-milling of a coarse serge fabric (East Indian wool-pulled worsted mixture), the linear shrinkages in warp and weft, increase in thickness, and decrease of porosity varied exponentially with the duration of milling. The processes of milling and felting are compared in relation to the effect on wool fabrics.

II. A method for measuring the thickness of a fabric by sandwiching it between two glass or metal plates is given, and suitable apparatus is described. From thickness measurements of a number of types of wool fabrics, and assuming that wool has  $d \ 1.31$ , it is concluded that no fabric has one half of its volume occupied by the actual wool fibres, even with tightly spun and closely set worsteds; in heavily milled woollens of the beaver type the air space is about two thirds. The effects of various processes such as raising, milling, crabbing, and scouring on a woollen cloth, with particular regard to its change in weight and thickness, are given. A. J. HALL.

Porosity ; a primary property of textiles. III. Porosity of yarns. IV. Instruments and experimental methods. J. SCHOFIELD (J. Soc. Dyers and Col., 1930, 46, 401-407, 407-409; cf. preceding abstract).--III. Formulæ relating yarn diameters and (a) tension, (b) counts, are given, and yarn porosity is defined.

IV. Yarn diameter is measured by means of a "filament micrometer," which is described and illustrated by diagrams. B. P. RIDGE.

Detection of fungus mycelium in mildewed cotton fabrics. M. W. JENNISON (Science, 1930, 72, 346—347).—The presence of fungus mycelium in raw cotton, undyed yarns and fabrics can be quickly detected by differential staining with Pianese IIIB stain. The material is washed in water or alcohol, stained for 15—45 min., decolorised in acid alcohol, and dried. Cotton fibres stain green and the fungus mycelium a deep pink. L. S. THEOBALD.

[Determination of] variations in lignin content of spruce wood. P. KLASON (Svensk Pappers-Tidn., 1929, 32, 494—496; Chem. Zentr., 1930, i, 3814).— Methods for the determination of lignin in wood are discussed, and a procedure is specified.

A. A. ELDRIDGE.

Paper-coating minerals and adhesives. M. B. SHAW, G. W. BICKING, and M. J. O'LEARY (Bur. Stand. J. Res., 1930, 5, 1189—1203; cf. B., 1930, 858).—Four different clays and one compound of diatomaceous earth, casein, glue, and modified starches have been examined with regard to use in papermaking for highgrade printing. The clay coatings bound well to the fibre sheet and gave good printing-quality paper.

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The coating with the diatomaceous earth compound did not adhere well to the base papers. The modified starches had not quite as strong adhesive quality as the casein or glue, but all coatings containing 18 pts. of starch per 100 pts. of clay were well bound to the body papers. Graded as to their clay suspending property, the adhesives were in the following descending order : starch, casein, glue. When the coated papers were printed by the half-tone process equally good results were obtained with the three different adhesives, although the starch-bound coatings may possibly have absorbed somewhat more ink. W. E. DOWNEY.

Test for sulphite-cellulose extract. GRASSER.— See XV.

See also A., Jan., 26, Determination of texture of ramie fibres (Eckling and KRATKY). 74, Cellulose xanthate (LIESER).

## PATENTS.

Digesters for production of cellulose. [Cascade] digestion of vegetable materials to obtain cellulose therefrom. E. C. BENTHALL and E. SPENCER (B.P. [A] 322,741 and [B] 322,754, 10.9.28).-(A) The digesters consist of cylindrical vessels containing a perforated plate near the bottom and one or more cone-shaped projections in the plate terminating below the upper level of the material being treated. The extraction liquid is circulated through the mass by means of vomit pipes which shower the liquid over the top of the charge. (B) In working with a series of digesters on the cascade principle the vomit pipes are closed before opening the lower value of one digester to pass the liquid to the next; in this way the steam pressure in the upper part of the digester blows the liquid through the extracted mass, leaving it in a semi-dry state. A. R. POWELL.

Treatment of cellulosic materials to render them more reactive towards esterification. BRIT. CELAN-ESE, LTD. (B.P. 338,745, 3.12.29. U.S., 11.12.28).— The material is treated first with 0.5-4% of nitric acid preferably in admixture with 75-330% of a lower aliphatic acid, e.g., glacial acetic acid, at  $35-60^{\circ}$  for about 1 hr. and then for a further hour at the ordinary temperature with 10-300% of an organic acid anydride, e.g., acetic anhydride, in the absence of esterification catalysts other than the nitric acid used in the first stage of the pretreatment. The resulting material esterifies rapidly, and the products are of good colour and give solutions of high clarity. D. J. NORMAN.

Manufacture (c) of derivatives of cellulose and (A, B) of artificial threads and other products from cellulose compounds. L. LILIENFELD (B.P. 335,906, 335,993—4, 25.3.29).—(c) Alkali-cellulose is treated with a hydroxyalkylating agent (ethylene chlorohydrin,  $\alpha$ -chlorohydrin) and then xanthated. (A) Cellulose xanthate is treated with a hydroxyalkylating agent, and the product is formed into threads etc. and coagulated. (B) The product of (c) is formed into threads etc. and coagulated. C. HOLLINS.

Production of lumen [acetate] silk. O. VON KOHORN (O. KOHORN & CO.), and H. SCHUPP (B.P. 314,543, 27.6.29. Ger., 30.6.28).—Hollow cellulose ester filaments are produced at the normal dry-spinning temperature by adding to the spinning solution a strongly acting cellulose ester coagulant of such a nature and in such quantity that immediately after extrusion and stretching there is formed at the surface of the filament a firm skin which becomes inflated by evaporation of the volatile solvent enclosed within the filament. Water and toluene, though ineffective separately, have the desired action when both are present. D. J. NORMAN.

Manufacture of artificial materials from cellulose esters or ethers. BRIT. CELANESE, LTD., R. P. ROBERTS, and L. W. GREGORY (B.P. 338,936, 29.7.29).—Filaments etc. obtained by coagulation of cellulose ethers or esters in aqueous media are improved both as regards tensile strength and transparency by impregnating them with high-boiling solvents, swelling agents, or plasticisers (diacetone alcohol, ethyl tartrate) and subsequently passing them round heated rollers while under tension. F. R. ENNOS.

Production and treatment of textile and other materials made of or containing cellulose. Η. DREYFUS (B.P. 338,989, 31.5.29).—A cellulosic solution, e.g., viscose, is extruded into a coagulating bath consisting of an aqueous solution containing 20% or more of sulphonic acids (Ce acids or upwards, e.g., benzenesulphonic acid) or of organo-mineral acids derived from mineral oxy-acids other than sulphuric acid by substitution of at least one, but not all, of the hydroxy-groups by organic radicals (e.g., methylphosphinic acid); or the filaments etc. after coagulation in the usual manner may be subsequently treated with the above solutions under tension, and finally washed. (Cf. B.P. 335,894; F. R. Ennos. B., 1931, 59).

Manufacture of artificial threads, hairs, bands, etc. from solutions of silk fibroin. I. G. FARBENIND. A.-G. (B.P. 339,089, 14.11.29. Ger., 14.11.28).—Natural silk waste is dissolved in orthophosphoric acid, and the viscous solution so obtained is pressed through capillaries or nozzles to form threads, which are coagulated by means of an aqueous solution of an alkali salt of a weak acid in the presence of one or more alkali salts of a strong acid, and are afterwards stretched. F. R. ENNOS.

**Evaporative spinning of artificial silk.** NELSON'S SILK, LTD., and J. NELSON (B.P. 338,881, 25.7.29).— In the apparatus claimed the spinning head has an annular space closed at the bottom by a detachable sheet-metal jet having a ring of perforations through which the liquid is forced. Heated air is drawn through the spinning vessel by means of two pipes, one communicating with the space inside and the other with that outside the jet, whereby more efficient drying of the filaments is ensured. F. R. ENNOS.

Elimination of gases from viscose silk cakes. BRIT. ENKA ARTIFICIAL SILK Co., LTD., Assees. of NAAML. VENN. NEDERLANDSCHE KUNSTZIJDEFABR. (B.P. 319,766, 5.9.29. Holl., 28.9.28).—The cakes are either superimposed with interposed plates, each having a central opening, while the uppermost cakes are covered over, or they are left in the spinning bowls, which are closed by tightly fitting covers. Air heated to at least 50° is then aspirated for a short time through the cakes. F. R. ENNOS.

**Production of fibrous material [from wood etc.].** D'A. M. CLARK. From RESPATS, INC. (B.P. 339,528, 11.1.30).—Waste wood or other ligneous material, preferably in a wet state and optionally after a mild digestion under pressure with water or caustic soda, is mixed with an abrasive agent such as sand or broken stone and ground to pulp under heavy pressure in a type of edgerunner. Wood of high resinous content may require two digestions, each followed by milling, but the cooking operations should be of such a character that the greater part of the gum and resin is retained by the fibre. The pulp, after separation of the abrasive agent, may be used for heat-insulating boards, or may be moulded to form panelling. D. J. NORMAN.

Solvent extraction of woods. A. D. LITTLE, Assr. to A. D. LITTLE, INC. (U.S.P. 1,762,785, 10.6.30. Appl., 8.10.27).—Resins and terpenes are removed from coniferous woods, e.g., longleaf yellow pine, by extraction with hydrocarbons of low average mol. wt. (28-78) which are gaseous at the ordinary temperature and pressure, e.g., which have an absolute vapour pressure at 75° of 1000-20,000 mm. Hg. The butane fraction (propane 9%, butane 89%, pentanes 2%) from petroleum or natural gas is a cheap and effective solvent, and may be used at, e.g., 75° under a pressure of 120 lb./in.<sup>2</sup> The wood is cut into chips of a size suitable for subsequent pulp-making and may contain 15-20% of moisture. Suitable plant is described in which provision is made for extracting the wood on the countercurrent principle, recovering the solvent, and distilling the extractives under reduced pressure. Average yields per ton for stump wood from long-leaf yellow pine are rosin 410 lb., turpentine 6.3 gals., pine oil 3.3 gals.

## D. J. NORMAN.

Manufacture of [esterified] products from wood. A. CARPMAEL. From I. G. FARBENIND. A.-G. (B.P. 336,969, 22.7.29).-Wood is acylated without appreciably affecting the combination between the cellulose and the other constituents of the wood by boiling the dried material for, e.g., 15 hrs. under reflux with an organic acid anhydride, e.g., 350% of acetic anhydride, in the absence of an inorganic catalyst. The wood may be powdered or treated in large sheets, in the latter case a superficial effect being obtained. The resulting wood ester after washing with acetone is insoluble in all solvents, but can be moulded at temperatures above 100°. giving products of high tensile strength and of improved resistance to water and light. Esterified wood gives only a faint colour reaction with phloroglucinol and hydrochloric acid. D. J. NORMAN.

Manufacture of pulp. F. G. RAWLING, ASST. to MEAD PULP & PAPER Co. (U.S.P. 1,766,944, 24.6.30. Appl., 21.1.29).—The discoloration of chemical pulp during drying is prevented by spraying dilute solutions of an acid-reacting salt, e.g., an alkali bisulphate, bisulphite, dihydrogen phosphate, or alum on to the wet web of pulp before it reaches the suction box, in sufficient quantity to bring the  $p_{\rm H}$  of the water to 5—7. Sodium bisulphate (nitre cake) solution (0·143 g. per litre) is particularly suitable. D. J. NORMAN.

Coating of material [for electrical conductors]. E. C. HALL, Assr. to WESTERN ELECTRIC Co., INC.

(U.S.P. 1,764,625, 17.6.30. Appl., 4.5.28).—A stranded core, e.g., an electrical conductor, is passed through an aqueous suspension of fibrous pulp in contact with a revolving cylinder mould so that a narrow ribbon of pulp is formed with the core at the centre. This ribbon is then wrapped round the core to give a felted fibrous sheath. A surface film of, e.g., cellulose acetate, nitrocellulose, or varnish is then applied, penetration of the filming solution into the fibrous sheath being prevented by first impregnating the fibres with a liquid, e.g., water, in which the coating agent is insoluble. Suitable apparatus is described. D. J. NOBMAN.

Water-resistant paper. Treating paper pulp to obtain paper of improved water-resistance. [Waterproof] paper-making. Greaseproof paper or paper which retains its strength in contact with grease. G. J. MANSON (U.S.P. 1,762,928-1,762,931, 10.6.30. Appl., [A, B, D] 14.3.27, [C] 24.10.27). -A pre-set aqueous dispersion of paraffin wax, or a mixture of this with other waxes or waterproofing agents, is used either alone or in conjunction with ordinary rosin size or a size made from oxidised rosin for imparting resistance to water and grease to paper and pulp products. A suitable emulsion, which gives good sizing effects for a wax content of  $1-1\frac{1}{2}$  in the finished paper and does not form spots, is prepared by agitating 33 pts. of wax with 40 pts. of water containing 4 pts. of sodium silicate (50% of dry solids) and 1 pt. of glue at 77° and then adding 2 pts. of alum dissolved in 20 pts. of water, the  $p_{\rm H}$  of the final emulsion being 7-7.3. The wax particles, being coated with a film of silicic acid, show a retention of 75-90% on the machine, and do not foul the wires or felts. Paper sized with wax in this way has a good "rattle" and retains its ink-resistance and colour when exposed to ultra-violet rays. D. J. NORMAN.

Treatment of [pile] fabrics. G. H. ELLIS, H. C. OLPIN, and E. E. WALKER, ASSTS. to CELANESE CORP. OF AMERICA (U.S.P. 1,783,608, 2.12.30. Appl., 15.3.28. U.K., 12.9.27).—See B.P. 302,208; B., 1929, 202.

Production of partially hydrolysed cellulose acetates. S. I. VLES (U.S.P. 1,782,796, 25.11.30. Appl., 25.10.27. Holl., 20.7.27).—See B.P. 292,398; B., 1928, 637.

Manufacture of cellulose [mixed] esters of both nitric acid and an organic acid. F. BECKER, Assr. to I. G. FARBENIND. A.-G. (U.S.P. 1,783,771, 2.12.30. Appl., 7.1.28. Ger., 15.1.27).—See B.P. 283,595; B., 1929, 750.

Preparation of textile fibres for spinning. G. C. LAURENOV (B.P. 339,848, 25.1.30. Belg., 31.1.29).

[Securing two jets in series in] apparatus for manufacture of artificial filaments, threads, etc. BRIT. CELANESE, LTD., A. H. TIDMUS, F. A. REESON, and R. H. J. RILEY (B.P. 339,670, 5.9.29 and 5.6.30).

Papermaking machines. T. D. NUTTALL, and BENTLEY & JACKSON, LTD. (B.P. 340,087, 6.11.29).

Separating fibre from air (B.P. 339,514).—See I. Naphthazarin derivatives (B.P. 316,950).—See IV. Bleaching of bast fibres etc. (B.P. 339,550).

Colouring paper (B.P. 314,068).—See VI. Artificial wood (B.P. 316,224).—See IX. Dielectric material (U.S.P. 1,769,874).—See XI. Pyroxylin solutions (U.S.P. 1,768,253). Talking-machine records (B.P. 337,437).—See XIII. Purification of cellulose (B.P. 338,941)—See XXII.

## VI.—BLEACHING; DYEING; PRINTING; FINISHING.

Theory of the dyeing of cellulose acetate silk. E. CLAYTON (J. Soc. Dyers and Col., 1930, 46, 367-368).—Picramic acid dyes cellulose acetate silk to a reddish-brown shade which may be oxidised to black by means of sodium dichromate or to brownish-black by diazotisation and coupling with *m*-tolylenediamine. From the behaviour of picramic acid, picric acid, and 2-aminoanthraquinone towards cellulose acetate silk it is concluded that the dyeing process is one of absorption (adsorption may play a small part) followed almost instantaneously by dissolution of the particles of the dye in the silk fibre. A true solution (in alcohol) of 2-aminoanthraquinone gives a shade on the silk which is 4-5 times as deep as that obtained with a suspension of equivalent concentration in the usual Turkey-red oil solution, but the dye may be removed by repeated extraction with alcohol or benzene in which the silk is not soluble. Dyed cellulose acetate is not an adsorption complex, since if a hot solution of cellulose acetate in acetone is coloured (dyed) with 2-aminoanthraquinone and then poured into excess of water the dye does not separate from the precipitated cellulose, whereas if poured into benzene (a solvent which precipitates cellulose acetate) a considerable proportion of the dye passes into the benzene. Any advances in the efficiency of dyeing methods applicable to cellulose acetate silk will probably depend on the ability to produce dyes which besides being soluble in cellulose acetate are either soluble in water or easily dispersed in an aqueous medium to give exceedingly fine suspensions.

A. J. HALL.

Moisture relations in cotton. URQUHART and ECKERSALL,—See V.

See also A., Jan., 58, Colorimetry without comparative standards (Hock and MÜLLER).

## PATENTS.

Bleaching, dyeing, etc. H. WADE. From DEUTS. GOLD- U. SILBER-SCHEIDEANSTALT VORM. ROESSLER (B.P. 323,397, 3.7.28).—The material to be treated is subjected in a vessel with a false bottom to the action of a stream of liquor from a centrally disposed spraying device, a second stream from a spray at the top of the vessel, and other streams emanating at various angles from sprays disposed around the sides of the vessel. A. R. POWELL.

Bleaching of bast fibres, especially flax, hemp, etc. I. G. FARBENIND. A.-G. (B.P. 339,550, 15.2.30. Ger., 16.3.29).—The material is treated with the following reagents in the order named : (1) hydrogen peroxide solution containing 0.5-1 g, of active oxygen per litre and about 6% of sodium carbonate on the weight of fibre for about 12 hrs.; (2) hypochlorous acid of  $p_{\rm H} < 5$ containing 1—8 g, of active chlorine per litre at the ordinary temperature; (3) warm sodium carbonate solution (2-8 g. per litre) for about 1 hr.; (4) neutral or faintly alkaline hypochlorite solution (0.5-4 g, of active chlorine per litre); (5) hydrogen peroxide solution, containing 0.5-1 g. of active oxygen and 2-3 g. of sodium silicate per litre, for  $\frac{1}{2}-2$  hrs. at 40-80°. For very resistant material, bath (4) may be faintly acid, in which case a further treatment with dilute sodium carbonate solution is necessary. The hydrogen peroxide from bath (5) may be used again in the first stage of the process. D. J. NORMAN.

Manufacture of coloured reserves in textile printing. A. CARPMAEL. From I. G. FARBENIND. A.-G. (B.P. 336,968, 22.7.29).—White material is printed with reserve salt to which has been added a Rapid Fast colour (nitrosoamine and hydroxynaphthoic or acetoacetic arylamide), dried, and steamed in a rapid ager ; it is then dyed in a roller vat and worked up as usual. The Rapid Fast colour appears upon a vat dye ground. C. HOLLINS.

Cleaning, wetting, and emulsifying [agents]. W. SCHRAUTH, ASST. to I. G. FARBENIND, A.-G. (U.S.P. 1,750,198, 11.3.30. Appl., 25.5.26. Ger., 30.5.23).— Naphthalene or tetrahydronaphthalene is sulphonated and condensed with an aliphatic or alicyclic alcohol above  $C_4$ , e.g., amyl alcohol, cyclohexanol, methycyclohexanol, hexyl alcohol. C. HOLLINS.

Brightening the colour of jute fibres. J. BER-LINERBLAU (B.P. 337,986, 12.11.29. Ger., 22.11.28).—The fibres, moistened with a 2—3% solution of hydrochloric acid, are treated with gaseous sulphur dioxide at normal pressure, the gas penetrating uniformly over the whole surface of the material. H. ROYAL-DAWSON.

Solution for fireproofing fibrous materials. A. A. THORNTON. From Soc. ANON. INVENZIONI GUADAG-NIN (S.A.I.G.) (B.P. 336,863, 10.12.29).—A solution containing ammonium chloride or carbonate, sodium chloride, boric acid, ammonia, and water is claimed. H. ROYAL-DAWSON.

Chemical treatment and washing of textile yarns in hank form. BRYSILKA, LTD., and F. W. SCHUBERT (B.P. 323,360, 22.12.28).—The hanks are suspended on a series of laterally projecting arms on a roller chain which passes over a succession of baths containing the chemical and washing liquors. As the hanks come over each bath the latter is raised until the hanks are immersed, then lowered again after treatment to allow the material to drain. A. R. POWELL.

Dyeing [of cellulosic fibres]. A. BODMER, Assr. to HEBERLEIN & Co., A.-G. (Re-issue 17,894, 2.12.30, of U.S.P. 1,694,526, 11.12.28).—See B., 1929, 93.

Coloration of materials made of or containing cellulose derivatives. H. DREYFUS (U.S.P. 1,783,607, 2.12.30. Appl., 27.12.27. U.K., 23.11.26).—See B.P. 285,969; B., 1928, 331.

Printing of fabrics. C. DREYFUS (U.S.P. 1,783,606, 2.12.30. Appl., 30.6.27).—See B.P. 293,022; B., 1929, 811.

Printing of wool with ester salts of leuco-compounds of vat dyes. W. TAUSSIG, ASST. to DURAND, & HUGUENIN (U.S.P. 1,784,768, 9.12.30. Appl., 12.10.28. Ger., 13.10.27).—See B.P. 298,648; B., 1929, 1012.

[Circulating system for] dyeing and like machines. C. E. OLDROYD (B.P. 339,909, 20.3.30).

Lecithin preparations (B.P. 317,730). Polyhalogenated fatty acids (B.P. 336,623).—See III. Chlorinated isodibenzanthrones (B.P. 336,775).—See IV. Waterproof fibrous materials (B.P. 315,839). Coloured rubber articles (B.P. 338,303).—See XIV.

## VII.—ACIDS; ALKALIS; SALTS; NON-METALLIC ELEMENTS.

Production of mixtures of ammonium sulphate and nitrate. W. GLUUD, W. KLEMPT, and F. BRODKORB (Ber. Ges. Kohlentech., 1930, 3, 170–196; Chem. Zentr., 1930, i, 3818–3819).—Optimal technical conditions for the production of mixtures of ammonium sulphate and nitrate from gaseous ammonia, 45–50 wt.-% nitric acid, and sulphuric acid ( $d \ 1.70$ ) have been determined. Calcium sulphate has been successfully substituted for sulphuric acid. A. A. ELDRIDGE.

Equilibrium between calcium phosphate, ammonia, and ammonium carbonate. N. D. PELIKH (J. Appl. Chem., Russia, 1930, 3, 351—360).—Ammonium hydrogen carbonate, particularly in the presence of carbon dioxide, reacts less readily than ammonium carbonate with calcium phosphate; in presence of ammonia partial precipitation of triammonium phosphate takes place, the yield not being proportional to the concentration of the solution.

CHEMICAL ABSTRACTS. Mechanical analysis of finely-divided natural phosphates. L. T. ALEXANDER and K. D. JACOB (U.S. Dept. Agric., Tech. Bull. No. 212, 1930, 24 pp.) .---The coarse material is removed by sedimentation, a dispersion agent added, and the suspension set aside for a length of time calculated from the modified Stokes' formula,  $V = 301 \cdot 84r^2/\eta$ , in which  $\eta$  is the viscosity of water at the temperature of the experiment (20-30°), so that particles 5  $\mu$  in diam. will have fallen 10 cm. By pipetting out from a depth of 10 cm. a portion of the suspension, the weight of particles  $< 5 \mu$  may be determined. The percentage of particles  $> 50 \mu$  is estimated by sieving, and that of particles from 50  $\mu$  to 5  $\mu$ by difference. It is possible that the method can be applied to the analysis of limestone and marl.

D. K. MOORE.

Preparation of basic cupric acetate from the neutral salt. Z. A. IOFA, S. M. KOBRIN, and L. L. KLYACHKO (J. Appl. Chem., Russia, 1930, 3, 366—374). —The salt 2Cu(OAc)<sub>2</sub>,Cu(OH)<sub>2</sub>,5H<sub>2</sub>O crystallises in blue prisms, whilst Cu(OAc)<sub>2</sub>,Cu(OH)<sub>2</sub>,5H<sub>2</sub>O (obtained below 45°) forms sky-blue hairs, and Cu(OAc)<sub>2</sub>,2Cu(OH)<sub>2</sub> forms square tablets. The salt Cu(OAc)<sub>2</sub>,Cu(OH)<sub>2</sub>,5H<sub>2</sub>O is prepared from the normal acetate, calcium oxide, and copper sulphate. CHEMICAL ABSTRACTS.

Micrography of red oxides of iron. ANON. Cadmium yellow. FINK and GROSVENOR.—See XIII.

See also A., Jan., 22, Phosphorescent calcium sulphide (GOYLE and SINGH). 38, Titania gel (KLOSKY). 39, Optimum H : N ratio for ammonia formation (GILLESPIF, and BEATTIE). 41, Phase equilibria in the system  $Cr_2O_3$ -SiO<sub>2</sub> (BUNTING). System  $Na_2SO_4$ -NaF-NaCl-H<sub>2</sub>O (FOOTE and SCHAIRER). System  $NaNO_3$ -Na<sub>2</sub>SO<sub>4</sub>-MgCl<sub>2</sub>-H<sub>2</sub>O (LEIMBACH). 49, Extraction of rubidium and cæsium from carnallite (JANDER and BUSCH). 53, Preparation of pure rhenium compounds (KRAUSS and STEINFELD). 55, Separation of alkali halides (COUSIN and DUFOUR). Bromo-iodometry (VAN DER MEULEN).

## PATENTS.

[Centrifugal] atomisers for liquids [sulphuric acid etc.]. J. LÜTJENS (B.P. 324,565, 11.3.29).—The spindle of the atomising tray is jacketed in a tube the upper end of which forms with a supply cup and an inverted bell a seal in the acid flowing down the tube; the lower end dips into the acid in the atomising tray to form a second seal. The cup is divided into sectors by means of radial partitions which do not reach to the circumference of the bell which rotates with the spindle of the tray. A. R. POWELL.

Apparatus for storing or treating nitric acid. H. FRISCHER (B.P. 339,032, 26.9.29).—The portion of the apparatus which remains covered by the nitric acid may be made of aluminium alloys containing magnesium or silicon; the uncovered portion, which is exposed to fumes, is constructed of iron-silicon or chromiumnickel alloys. W. J. WRIGHT.

Elimination of silica in the treatment of natural silicates with acids to render soluble some of their constituents. F. JOURDAN (B.P. 339,028, 24.9.29. Ital., 22.10.28).—To reduce the amount of silica in solution, the temperature of reaction is raised to about 117° and energetic stirring is employed. The silica may be further reduced by adding to the acid about 40% of a salt identical with one of those produced in the reaction, and by acidifying the clear liquid just sufficiently to prevent salts in solution from separating. W. J. WRIGHT.

Manufacture of bleaching powder. E. KREBS (B.P. 338,940, 30.7.29).—To regulate the temperature in vertical absorbers and prevent the reaction from being restricted to only a few of the shelves, air is admitted at one or two points in the bottom of the absorber, whereby entangled chlorine is conveyed to the upper shelves. The chlorine may be introduced at various parts of the absorber, and may be drawn off at certain points, passed through a cooler, and re-admitted. If necessary, the absorber itself may be cooled by irrigation. W. J. WRIGHT.

Manufacture of anhydrous aluminium chloride. W. R. AUSTIN and J. N. SMITH, ASSTS. to F. G. CLARK (U.S.P. 1,752,936, 1.4.30. Appl., 7.7.23).—A mixture of aluminous material and carbon is introduced into the arc of an electric furnace, a stream of chlorine being admitted simultaneously. Intensive local heating at 3600° is thus obtained, and the atmosphere of carbon monoxide and aluminium chloride vapour, surrounding the reacting agents, insulates the reaction zone from the walls of the furnace, so that the temperature of these may be as low as 100°. W. J. WRIGHT. Recovery of alkali xanthates. W. HIRSCHKIND, Assr. to GREAT WESTERN ELECTRO-CHEM. Co. (U.S.P. 1,753,787, 8.4.30. Appl., 28.11.24).—The mother-liquor obtained in the manufacture of alkali xanthates is treated with an alkali hydroxide to precipitate a further quantity of xanthate, a total yield of 80% being thus obtainable. The residual mother-liquor may be used for the froth-flotation of ores. W. J. WRIGHT.

**Preparation of cyanates.** DEUTS. GOLD- U. SILBER-SCHEIDEANSTALT VORM. ROESSLER (B.P. 339,220, 19.3.30. Ger., 10.4.29).—Alkaline-earth compounds, or basic alkali compounds except the hydroxides, are caused to react at about 140° with urea. An alkaline-earth cyanate may be prepared first, and then this converted into the corresponding alkali cyanate by treating it in aqueous solution with an alkali compound.

W. J. WRIGHT.

Treatment of aluminous materials. B. R. F. KJELLGREN (U.S.P. 1,752,641, 1.4.30. Appl., 23.8.24). —The material is heated with sulphuric acid at 150— 200°, leached with water to remove soluble sulphates, and treated with an ammonium salt to produce ammonium alum, this being heated to recover ammonium sulphate by sublimation and to yield aluminium sulphate. W. J. WRIGHT.

Treatment of aluminous materials for production of aluminium sulphate and alumina therefrom. B. R. F. KJELLGREN (U.S.P. 1,752,599, 1.4.30. Appl., 17.8.25. Swed., 27.6.25. Renewed 22.7.29).—An improvement of the process described in U.S.P. 1,752,641 (preceding abstract) consists in heating the material with anhydrous ammonium sulphate in an atmosphere of sulphur dioxide and nitrogen formed by dissociation of ammonium sulphate, the ammonium alum being subsequently decomposed in a similar atmosphere.

W. J. WRIGHT.

Manufacture of chromium trioxide. C. ARNOLD. From HARSHAW CHEM. Co. (B.P. 338,938, 30.7.29) .---Oleum and an alkali compound, such as anhydrous sodium dichromate, are continuously introduced into an insulated and electrically-heated reaction vessel, provided with stirrers. The vessel is preheated to about 195°, but the reaction is maintained at 195-210° by the exothermic heat and controlled by the feed. The molten products pass from the bottom of the vessel through an exit pipe at the top into an insulated centrifuge or gravity separator, from which the lighter portions are led through a pipe to any suitable collecting vessel, and the heavier portions to a rotating drum or band conveyor, the solidified product being removed in flakes. W. J. WRIGHT.

Manufacture of chromates. O. F. TARR, Assr. to MUTUAL CHEM. Co. (U.S.P. 1,752,863, 1.4.30. Appl., 3.4.29).—Chrome ore is roasted in an oxidising atmosphere with only about half its weight of burnt lime and with sufficient alkali carbonate to combine with only part of the chromium, the leached and dried product being then groasted with a further amount of alkali carbonate to combine with the remaining chromium.

W. J. WRIGHT.

Manufacture of phosphorus oxychloride and thionyl chloride. G. J. SCHUDEL, Assr. to Elko CHEM. Co. (U.S.P. 1,753,754, 8.4.30. Appl., 18.11.26).— A mixture of liquid sulphur dioxide and liquid chlorine is caused to react with phosphorus contained in a liquid carrier, which may consist of phosphorus oxychloride or a mixture of this with thionyl chloride from a previous operation, the products being separated by fractional distillation. W. J. WRIGHT.

Purifying rare gases. R. E. MIESSE, Assr. to NEW PROCESS METALS CORP. (U.S.P. 1,753,298, 8.4.30. Appl., 3.1.27).—The gases are introduced into a glass bulb, in which are fixed two electrodes, one or both of these consisting of an alloy of cerium and lanthanum with traces of other rare-earth metals. On passing an electric discharge through the gases, particles of the alloy either combine with the impurities or take them up and deposit them on the walls of the container.

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Preparation of catalytic gels. E. B. MILLER and G. C. CONNOLLY, Assrs. to SILICA GEL CORP. (U.S.P. 1,782,857, 25.11.30. Appl., 19.11.26).—See B.P. 280,934; B., 1929, 283.

Production of colloidal silicic acid. A. P. OKATOFF (U.S.P. 1,783,304, 2.12.29. Appl., 12.11.28).—See B.P. 328,241; B., 1930, 613.

Apparatus for production of ammonia-air mixtures. H. PAULING (U.S.P. 1,784,074, 9.12.30. Appl., 29.12.27. Ger., 15.10.26).—See B.P. 292,830; B., 1928, 641.

Production of hydroxides of alkali metals. E. HEINZE, ASST. to I. G. FARBENIND. A.-G. (U.S.P. 1,784,066, 9.12.30. Appl., 26.3.26. Ger., 1.4.25).—See B.P. 290,719; B., 1928, 522.

Manufacture of metallic nitrates. F. A. HENGLEIN, Assr. to I. G. FARBENIND. A.-G. (U.S.P. 1,783,647, 2.12.30. Appl., 28.11.27. Ger., 8.12.26).—See B.P. 306,998; B., 1929, 393.

Recovery of sulphur from alkali polysulphides. H. LANGHEINRICH, ASST. to I. G. FARBENIND. A.-G. (U.S.P. 1,783,725, 2.12.30. Appl., 5.8.29. Ger., 23.8.28).—See B.P. 323,908; B., 1930, 325.

Manufacture of iron carbonyl. A. MITTASCH and C. MÜLLER, ASSTS. to I. G. FARBENIND. A.-G. (U.S.P. 1,783,744, 2.12.30. Appl., 25.3.26. Ger., 30.3.25).— See B.P. 244,895 ; B., 1926, 191.

Separation of cobalt and iron from solutions rich in iron as obtained by lixiviating roasted pyrites. N. E. LENANDER, ASST. to ORKLA GRUBE-AKTIEBOLAG (U.S.P. 1,783,046, 25.11.30. Appl., 27.6.29. Ger., 26.7.26).—See B.P. 329,543; B., 1930, 712.

Cooling agents (B.P. 339,194).—See I. Deoxidiser (U.S.P. 1,736,464).—See II. Hydrogen and acetylene (B.P. 337,088).—See III. Fireproofing solution (B.P. 336,863).—See VI. Thoriated tungsten (U.S.P. 1,764,644).—See X. Gas-filled tubes (U.S.P. 1,769,025).—See XI. Paint remover (B.P. 337,944).— See XIII. Fertilisers (B.P. 336,651, 337,402, and 337,415). Compound fertilisers and sodium bicarbonate (B.P. 338,007).—See XVI.

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W. J. WRIGHT.

## VIII.-GLASS; CERAMICS.

Influence of radiation on the coloration of glasses. P. GILARD and A. LECRENIER (Chim. et Ind., 1930, 24, 1035-1051).-As a result of exposing glasses of various compositions to the action of radium radiation the authors concluded that soda-RO-silica glasses assumed a brownish tint when RO was an alkaline-earth oxide, the corresponding potash glasses being somewhat more yellow; barium oxide gave greener tints than calcium or magnesium oxide; soda-lime-borosilicates acquired brownish-grey tints, whilst the corresponding potash glasses were bluish-grey. The violet colouring of irradiated pure fused silica was not the same as that of pure crystal quartz, nor was the intense coloration of glass with only 0.018% MnO wholly caused by a chemical effect of the rays on the manganese oxide. Rather was the cause physical, namely a rearrangement of the atomic groupings with corresponding effect on the M. PARKIN. absorption.

## Use of fuel oil. LUBBOCK.—See II.

See also A., Jan., 18, Double-refracting "Corex" glass (RAYLEIGH). 36, Measurements with kaolin suspensions (REIFENBERG).

#### PATENTS.

Coloured heat-resisting glass. W. C. TAYLOR, Assr. to CORNING GLASS WORKS (U.S.P. 1,754,065 and 1,754,182, 8.4.30. Appl., [A] 12.6.25, [B] 10.6.26).— Lithia  $1\frac{1}{2}$ —3%, an equal or greater amount of potash, with alumina 1—3%, and boric oxide less than twice the alkali, constitute with 79% or more of silica a lowexpansion borosilicate glass which is capable of being coloured by the usual colouring oxides in the same way as an ordinary glass. A preferred base glass is SiO<sub>2</sub> 82.6, B<sub>2</sub>O<sub>3</sub> 8.8, K<sub>2</sub>O 3.4, Li<sub>2</sub>O 3, Al<sub>2</sub>O<sub>3</sub> 2.2%, which gives a green with 1.4% CuO and 0.012% CoO, yellow with 0.25% NiO, 0.2% MnO<sub>2</sub>, and 0.6% of " uranium oxide" [? sodium uranate], and a blue with good absorption in other parts of the spectrum with 1% CuO and 0.1% CoO. In (B) the green glass is specially claimed. M. PARKIN.

Manufacture of marbled or multicoloured glass. C. LOCREILLE (B.P. 339,583, 8.4.30. Belg., 9.4.29).— Glasses of different colours melted separately at 1000— 1200° are poured into a mass of ground-colour glass of approximately the same composition and melted at a somewhat higher temperature (1000—1400°).

## L. A. COLES.

Non-discolouring safety glass. DU PONT VISCOLOID Co. (B.P. 310,475, 26.4.29. U.S., 26.4.28).—Nondiscolouring plasticising agents comprising, e.g., amyl acetate, ethylene glycol diacetate or ethyl ether, triacetin, alkyl phthalates, and not more than 12% of camphor, are used in the manufacture of the plastic layer having pyroxylin or a carbohydrate ester or ether as base. L. A. COLES.

Light filters for increasing and producing colour contrasts. DEUTS. GASGLÜHLICHT-AUER-GES. M.B.H., Assees. of F. WEIDERT (B.P. 338,334, 29.10.29. Ger., 15.12.28).—Glasses suitable for use as spectacle lenses or in illuminating systems or for accentuating colour contrasts contain 0.3 g. Nd<sub>2</sub>O<sub>3</sub> per cm.<sup>2</sup> of irradiated surface. Ultra-violet light may be absorbed by adding ceric oxide, and the contrast can be further intensified in certain cases by adding other oxides, such as those of cerium or praseodymium. M. PARKIN.

Compositions for coating [the interior surface] of vitreous articles. A. M. HAGEMAN and A. F. LINDSTROM, ASSTS. to WESTINGHOUSE LAMP CO. (U.S.P. 1,752,792, 1.4.30. Appl., 27.1.25).—Two preferred compositions are: (a) aluminium silicate (or kaolin) 100 g., sodium hydroxide 15 g., zinc phosphate substantially 50 g., with 1 litre of sodium silicate solution, d 1.025; (b) aluminium silicate 50 g., zinc phosphate 50 g., with 1 litre of water. The ingredients are ground in a ball mill to a fine slip and applied to such articles as electric lamp bulbs to produce a light-diffusing layer. Suitable pigments may replace part of the "filler" (aluminium silicate) to give coloured effects. The coating is set by the momentary application of a relatively high temperature, after which it is baked at 300-400° for 3-4 min. M. PARKIN.

Insulating a glass sheet from a receiving surface. Y. BRANCART (B.P. 338,477, 5.4.30. Belg., 20.4.29).— The receiving surface is insulated from a glass sheet produced by casting or rolling by the gaseous products of combustion from pulverised solid (e.g., charcoal, retort carbon, or poplar wood sawdust), liquid (e.g., petrol) or plastic fuel containing no gases which would injure the surface either applied to the surface or burned below it, the surface in the latter case being perforated. Alternatively, a solid rod coated with the fuel mixtur is passed between the surface and the glass.

M. PARKIN.

Manufacture of refractory articles [for contact with molten glass]. HARTFORD-EMPIRE Co., Assees. of P. G. WILLETTS (B.P. 316,129, 7.6.29. U.S., 23.7.28). —Mixtures are used containing 35—88% Al<sub>2</sub>O<sub>3</sub>, 11— 63% SiO<sub>2</sub>, not more than 1.5% of oxides of iron, magnesium, and alkali metals, and sufficient fluxes (alkalineearth oxides) to cause the sole formation of mullite or corundum crystals in a glassy matrix when the mixture is heated below the fusion point of the materials. Suitable mixtures comprise, *e.g.*, Georgia Klondike white kaolin, Arkansas clay No. 23, and potters' flint.

L. A. COLES.

Manufacture of refractory materials from natural magnesium silicates. METALLGES. A.-G. (B.P. 337,605, 7.11.29. Ger., 9.11.28).—Ferruginous magnesium silicates (olivine, peridotite, serpentine, asbestos, etc.) are heated in an oxidising atmosphere with magnesia or substances yielding it in quantities at least sufficient to convert the iron into magnesium ferrite, the free silica into magnesium orthosilicate, and compounds of aluminium, chromium, etc., when present, into magnesium aluminate, chromate, etc. The initial mixtures may be worked to a paste with, *e.g.*, sulphitecellulose waste liquor and moulded under high pressure before firing. L. A. COLES.

Glass-melting tanks. HARTFORD-EMPIRE Co., Assees. of W. T. BARKER (B.P. 340,110, 30.11.29. U.S., 20.5.29).

Manufacture of glass sheets. CHANCE BROS. & Co., LTD., and A. L. FORSTER (B.P. 339,764, 20.11.29).

Continuously drawing tubes and rods of glass and the like. S. G. S. DICKER. From NAAML. VENN. MAATS. TOT EXPLOITATIE VAN UITVINDINGEN (B.P. 340,076, 21.10.29).

**Moulding of articles in pure fused silica.** QUARTZ & SILICE (B.P. 340,167, 13.2.30. Fr., 18.4.29).

[Press for] manufacture of objects of porcelain, earthenware, clay, and other ceramic masses. INTERNAT. GEN. ELECTRIC CO., INC., Assees. of ALLGEM. ELEKTRIZITÄTS GES. (B.P. 318,866, 10.9.29. Ger., 10.9.28).

Synthetic resins (B.P. 315,807—8, 338,002, and 338,024).—See XIII.

## IX.—BUILDING MATERIALS.

Cement chemistry in theory and practice. H. KÜHL (Cement, 1930, 3, 1297-1304, 1456-1463, 1607-1616).—The historical development of research on cement is surveyed, noting the work of Cobb (J.S.C.I., 1910, 29, 69) as the origin of the "dynamic" method of investigation. It has been found possible to correlate laboratory trials with the full-scale production by mixing the constituents in a small porcelain mill, burning the mixture in the form of small balls or rods on platinum in an electric furnace, and finally grinding the clinker in the porcelain mill. Quantities of 50-100 g. may be used and provide sufficient material for the small testbars for the measurement of mechanical strength. It seems probable that at 800° only monocalcium aluminate and monocalcium silicate are present; conversion of the latter into dicalcium silicate begins at 900° and proceeds at a more rapid rate as the temperature rises, until at 1150° both mono-salts are converted into the dicalcium compounds. Dicalcium ferrite, forming at 1250°, is the essential preliminary to the formation of tricalcium silicate, and at 1500° dicalcium ferrite, tricalcium silicate, and dicalcium aluminate are the chief constituents. The spontaneous falling to powder of clinker burned at about 1250° is attributed to the increase in volume caused by the conversion of the  $\alpha$ or  $\beta$ - into the  $\gamma$ -modification of dicalcium silicate. From a mineralogical study alite and celite may be regarded as the principal constituents of a normal Portland cement. C. A. KING.

Overheating of aggregates [is] found detrimental to concrete. W. H. BACHELDER (Eng. News-Rec., 1930, 105, 973).—The highest strength of concrete was attained when the batch was laid at 21°. Approx. 20% of the strength was lost if the temperature was as high as 55°. C. A. KING.

Asphaltic bitumen. JACKSON. Creosote oil. POPOV. Use of fuel oil. LUBBOCK.—See II.

## PATENTS.

[Electric kiln etc. for] manufacture of cement and lime. H. J. BENHAM (B.P. 316,715, 19.5.28).— The charge passes through a slightly inclined rotating tube furnace where it is preheated by the gases issuing from the shaft furnace into which the material is discharged from the rotary furnace. The shaft is provided with a series of baffles inclined downwards at 45° and

fixed alternately to opposite walls, and tapers towards its lower end into a constricted space in which the electrodes are situated. Below this chamber is a conveyor on to which the sinter falls for transfer to the crushers. A. R. POWELL.

Manufacture of cement and other pulverulent or granular products. R. POURBAIX (B.P. 338,463, 19.2.30).—As an alternative to the use of paste mills the cement mixture is mixed with water in a diluter from which it runs in a number of streams on to an inclined screen, the coarser particles being washed off the screen into a collector and returned to the diluter. A series of screens may be used by perforating the bottom of the collecting tank of an upper screen and allowing the cement slip to fall in the form of jets on to a lower inclined sieve. C. A. KING.

Cements, concretes, and mortars. J. W. BATTERS-BY (B.P. 338,242, 27.8.29).—Prior to mixing with water, Portland cement or lime for mortar is mixed with 1-5%of a soluble hydrated alkali silicate, which may be ground together with cement clinker. For special use in sealing porous places the silicate may equal the cement in quantity. C. A. KING.

Waterproof cements. E. L. GEORGE. From Soc. ANON. INVENZIONI GUADAGNIN (S.A.I.G.) (B.P. 336,860, 9.12.29).—The components consist of washed sand, resin, gypsum, alum, flaxseed oil, and water.

H. ROYAL-DAWSON.

Manufacture of waterproof cement. J. M. Evans, Assr. to G. W. WALLACE (U.S.P. 1,755,638, 22.4.30. Appl., 20.6.28).—Portland cement is mixed with, *e.g.*, 5—25% of clay which has been used for treating petroleum or its fractions. L. A. Coles.

Production of a cement-containing cold glaze for concrete, brickwork, etc. N.V. NEDERL. FABR. VAN BETON-EMAILLE "FORTOLIET" (B.P. 313,577, 14.6.29. Holl., 14.6.28).—A paste (1 pt.) containing a soluble soap and calcium chloride in about equal proportions is diluted with 10—15 pts. by wt. of water, and the whole mixed with double its weight of cement. H. ROYAL-DAWSON.

Treatment of gypsum and alabaster to give it the appearance and hardness of marble. F. J. G. GARNER (B.P. 338,465, 28.2.30).—Native block gypsum etc., after being shaped, is heated to 150—200° and immersed in a solution containing magnesium sulphate 1 oz., calcium chloride (fused) 1 oz., concentrated sodium silicate solution 1 lb., and water 1 gal. The stone is then polished. C. A. KING.

Manufacture of compositions containing wood fibre [artificial wood]. O. KAYSER (B.P. 316,224, 23.7.29. Ger., 25.7.28).—An aqueous suspension of wood pulp, e.g., coarse mechanical pulp of 5—12% consistency, is fed continuously on to a revolving cylinder mould in sufficient quantity to give a homogeneous board (thickness up to 25 mm.). Strong suction, e.g., 0.5 atm., is applied to the reverse side of the mould. The product shows no tendency to flake and can therefore be veneered. D. J. NORMAN.

Preparation of waterproof board. N.V. DE BATAAFSCHE PETROLEUM MAATS. (B.P. 319,213, 16.9.29.

U.S., 17.9.28).—The outer absorbent coverings of plaster board are treated on one or both sides, just prior to the introduction of the plaster core, with a thin layer of an aqueous dispersion of a waterproofing agent of such a type that complete coalescence of the dispersed waterproofing agent does not take until substantially the whole of the aqueous phase has been removed. This permits the plaster core to dry completely before the formation of a continuous film of the waterproofing agent. An aqueous dispersion of asphalt (m.p. 38—93°) with colloidal clay as the dispersing agent is suitable. D. J. NORMAN.

Treatment [insect- and fire-proofing] of wood. F. S. VIVAS, ASST. to INTERNAT. FIREPROOF PRODUCTS CORP. (U.S.P. 1,768,175, 24.6.30. Appl., 8.10.27).—The wood is successively treated *in vacuo* with sodium carbonate solution  $(2\frac{1}{2}$  lb./gal.), dried *in vacuo* to remove about 60% of the water, and treated under pressure with copper sulphate solution  $(\frac{1}{2}$  lb./gal.) to precipitate Cu(OH)<sub>2</sub>,CuCO<sub>3</sub> in the pores. L. A. COLES.

Impregnated wood and process of treating wood. J. R. COOLIDGE, 3RD, Assr. to MONTAN, INC. (U.S.P. 1,766,606, 24.6.30. Appl., 3.6.27).—The wood is impregnated at, e.g.,  $82-93^{\circ}$  and under 200 lb./in.<sup>2</sup> with a 20—40% solution containing about equal proportions of ammonium chloride (or sulphate), borax, ammonium phosphate, and, if desired, sodium chloride ; the pores of the treated wood, after a partial drying, may then be sealed with soap solution. (Cf. U.S.P. 1,734,714—5 ; B., 1930, 146.) L. A. COLES.

**Products for double-impregnation of wood.** Soc. DE RECHERCHES ET DE PERFECTIONNEMENTS INDUS-TRIELS (B.P. 339,247, 2.9.29. Fr., 8.4.29. Addn. to B.P. 310,805; B., 1930, 1031).—The first impregnating solution in the prior process is replaced by a solution containing an alkali (sodium) sulphide as solvent for the arsenic sulphide (which may be formed *in situ*, as before), and, if desired, pyrolignite obtained by the action of an acetate on hydrophenolic compounds; the second impregnating solution is that described in B.P. 310,804 (cf. B., 1930, 1031). L. A. COLES.

Preparation of paving material. G. H. ALVEY and E. A. YOUNG, ASST. to UVALDE ROCK ASPHALT CO. (U.S.P. 1,767,830, 24.6.30. Appl., 2.4.28).—The material comprises crushed (e.g., Uvalde) rock asphalt, a heavyoil flux rich in constituents evaporating below 163°, and dilute acid. L. A. COLES.

Forming and using asphaltic or bitumastic materials for surfacing roads or waterproofing purposes. F. A. HILL (B.P. 338,206, 16.8.29).— Asphaltic residues (35—55%) are mixed intimately with a fuel oil or petroleum product (65—45%) from which the lighter fractions including kerosenes have been distilled. The mixing is made preferably at above 100°. C. A. KING.

Manufacture of materials suitable for road construction, coating purposes, etc. from asphalt, tar, and the like. J. Y. JOHNSON. From I. G. FARB-ENIND. A.-G. (B.P. 337,521, 4.9.29).—The tenacity, elasticity, and stability to cold of the products are improved by the addition of 0.1-20% (usually 0.5-5%) of synthetic polymerisation products of diolefines

(preferably of butadienes), prepared, e.g., as described in B.P. 312,201 (B., 1929, 612); these may be vulcanised or added in aqueous suspension or emulsion.

L. A. COLES.

Accelerating the hardening of hydraulic binding means. W. KIRCHNER, ASST. to CHEM. FABR. GRÜNAU, LANDSHOFF & MEYER A.-G. (U.S.P. 1,782,471, 25.11.30. Appl., 21.3.27. Ger., 11.1.27).—See B.P. 275,897; B., 1927, 816.

[Copperclad-felt] flashing and valley material for roofs etc. INTERNAT. COPPERCLAD Co., Assees. of W. McI. SHAKESPEARE (B.P. 340,168, 17.2.30. U.S., 1.3.29).

Dryers for wallboard (B.P. 314,013, 314,982, and 337,432).—See I. Fibrous material (B.P. 339,528). Solvent extraction of wood (U.S.P. 1,762,785). Products from wood (B.P. 336,969).—See V.

## X.—METALS; METALLURGY, INCLUDING ELECTRO-METALLURGY.

Production of high-test cast iron. R. MOLDENKE (Trans. Amer. Electrochem. Soc., 1930, 58, 385-401).-High-test cast iron (formerly misnamed " semi-steel ") is defined as any variety of cast iron of unusual strength and elasticity. The tensile strength must exceed about 30,000 lb./sq. in. of the transverse strength 2500 lb./in.<sup>2</sup>, with 0.25 in. deflection of the Standard Arbitration Test Bar. The constitution of such cast irons is discussed and the conditions necessary for their production are outlined. The advantages and disadvantages of the cupola, reverberatory furnace, open-hearth furnace, and electric furnace in the production of cast iron of this quality are examined at length. It is concluded that although the bulk of high-test cast iron will undoubtedly be made in the cupola, the higher grades, particularly of alloy cast iron, will be produced in the electric furnace. Future development will probably lie in the production of cast irons of special composition which are subsequently heat-treated. Thus a high-strength cast iron containing about 1.75% Si, after treatment for 5 hrs. at about 815°, had a tensile strength of over 100,000 lb./in.<sup>2</sup> and a high elasticity, and the fracture appearance was the same throughout sections of any thick-H. J. T. ELLINGHAM. ness.

Proposed method for accurately evaluating results of corrosion tests of ferrous metals. K. PITSCHNER (Trans. Amer. Electrochem. Soc., 1930, 58, 173 -185).—The essential feature of the method consists in treating the corroded specimen of iron with excess of solid iodine in the presence of water. Metallic iron dissolves whereas the corrosion products are unattacked and can be filtered off. After driving off the excess of iodine, the iron is precipitated with ammonia solution, the ferric hydroxide dissolved in dilute hydrochloric acid and reduced with a slight excess of stannous chloride. Potentiometric titration with dichromate gives two end-points, the first corresponding to the excess of stannous chloride present and the second to the stannous and ferrous chlorides. Details of the titration are given. The application of the method to the determination of rates of corrosion of ferrous metals and the pro-

tective value of various coatings on iron and steel is discussed. H. J. T. ELLINGHAM.

Destructive action of molten zinc, at and above galvanising temperatures, on metals and alloys. VIII. Action on copper, copper alloys, and highsilicon iron ("duriron" and "ferralt"). W. G. IMHOFF (Amer. Met. Market, 1930, 37, No. 140, 10, No. 141, 10; cf. B., 1930, 1114).—Copper, "everdur" (Cu 94.76, Si 4.13, Mn 0.74, P 0.06, Fe 0.04%), and the high-silicon iron are readily attacked.

CHEMICAL ABSTRACTS. Detection of tellurium in bismuth. H. TÖPEL-MANN (Z. anal. Chem., 1930, 82, 284-295).—The metal (10 g.) is dissolved in nitric acid and the solution evaporated with sulphuric acid to expel nitric acid. The residue is dissolved in 50 c.c. of hydrochloric acid and the solution treated with 1 mg. of arsenic as sodium arsenite and then with 5 c.c. of 10% stannous chloride solution. Next day the brown precipitate of arsenic and tellurium is collected, washed with dilute stannous chloride solution and then with distilled water, and dissolved in a few drops of nitric acid. The solution is evaporated to dryness and the residue transferred by means of a few drops of hydrochloric acid to a depression in a carbon electrode. A spectrograph is then taken with a condensed spark and the plate is examined for the presence of the line  $2385 \cdot 8$ A., which can be detected if the bismuth contains only 0.00005% Te. A. R. POWELL.

Cemented tungsten carbide. Action of the cementing material. L. L. WYMAN and F. C. KELLEY (Amer. Inst. Min. Met. Eng. Tech. Pub., 1930, No. 354, 21 pp.).—Cobalt added as a binder becomes a solvent for the tungsten carbide grains. CHEMICAL ABSTRACTS.

Effect of certain alloying elements on structure and hardness of aluminium bronze. S. F. HERMANN and F. T. SISCO (Amer. Inst. Min. Met. Eng. Tech. Pub., 1930, No. 365, 23 pp.).—Addition of cobalt, manganese, or silicon markedly increases the hardness of aluminium bronze, whilst the effect of nickel or iron is slight and erratic. The coefficient of equivalence of nickel with respect to the aluminium content is small; for iron it is zero, for manganese and silicon appreciable, and for cobalt negative. CHEMICAL ABSTRACTS.

Aluminium-silicon-magnesium casting alloys. R. S. ARCHER and L. W. KEMPF (Amer. Inst. Min. Met. Eng. Tech. Pub., 1930, No. 352, 34 pp.).—Aluminiumsilicon-magnesium alloys have good foundry characteristics, including ease of casting and relative insensitivity to high pouring temperature. Resistance to corrosion is greater than that of an aluminium-silicon-copper (4%) alloy, especially when the iron content is low and no precipitation heat-treatment is used. The density and thermal expansion are lower than in the aluminiumcopper alloys, whilst the electrical and thermal conductivities are high. CHEMICAL ABSTRACTS.

Plating on [steel] radiator shells. O. P. WATTS (Trans. Amer. Electrochem. Soc., 1930, 58, 187-205).— Photomicrographs of cross-sections of composite plating (copper-nickel-chromium) on steel radiator shells are reproduced, and various types of faults are pointed out and related to the pretreatment of the steel surface and the conditions of plating. Tests for pinholes in nickel and chromium plate and cracks in the latter were also carried out, and the results compared with those of immersion tests in lake-water and sea-water. Data are given showing the extent of local variations in the thickness of nickel and copper deposits under various conditions of plating. H. J. T. ELLINGHAM.

Electrodeposition of iron-nickel alloys from cyanide solutions. L. E. STOUT and J. CAROL (Trans. Amer. Electrochem. Soc., 1930, 58, 207-219).-An investigation has been made of the composition of ironnickel alloys  $(x_{A}\%$  Ni) obtained by the electrolysis at various temperatures and current densities of solutions prepared by dissolving nickel cyanide, potassium ferrocyanide, and tartrate in water so as to give a total metal concentration (iron + nickel) of 14 g./litre, but with various proportions of iron and nickel  $(x_s\% \text{ Ni})$ . The presence of tartrate prevents the formation of an insulating deposit on the anode and improves conditions at the cathode. When  $x_{\rm s} < 60\%$ ,  $x_{\rm A}$  remains practically constant (about 10% at 25°) except at very high current densities, when it increases somewhat, but when  $x_{\rm s}$ exceeds about 60%,  $x_{\rm A}$  increases rapidly especially at higher temperatures and current densities. For a given value of  $x_s$ ,  $x_A$  increases with current density, and at high current densities it also increases with temperature except when  $x_s$  is low, when  $x_s$  remains nearly constant. Values of the current efficiency of metal disposition are also recorded. Excess of free cyanide increases  $x_{\rm A}$ . Thus with an addition of 75 g. of potassium cyanide per litre  $x_{\rm A}$  reached 100% at 5 amp./dm.<sup>2</sup> when  $x_{\rm S}$  was only 5%. The deposits were all light grey in colour, but tended to become darker and more lustrous with increasing iron content. Deposits obtained at 25° with low current densities had the best appearance.

H. J. T. Ellingham.

Deposition of nickel-cobalt alloys. C. G. FINK and K. H. LAH (Trans. Amer. Electrochem. Soc., 1930, 58, 241-249).-Determinations have been made of the composition of cobalt-nickel alloys electrodeposited at 1 amp./ dm.<sup>2</sup> from solutions at 50° containing cobalt and nickel sulphates in various proportions, sodium chloride, and boric acid. The percentage of cobalt in the deposit increases rapidly with increasing proportion of this metal in the bath, and is also increased by raising the temperature, the current density, the  $p_{\rm H}$  value of the bath, or its total metal concentration. Increasing the current density above 2 amp./dm.<sup>2</sup> or the  $p_{\rm H}$  above 7 resulted in unsatisfactory deposits. Alloys of a whiteness most nearly approaching that of silver contained 25-45% Co, and were obtained by electrolysis at 1-2amp./dm.<sup>2</sup> of a 1—2N-nickel sulphate, 0.1—0.4Ncobalt sulphate, 0.15N-sodium chloride, 0.3-0.5Nboric acid solution at 50°. Deposits containing over 25% Co are as hard as pure cobalt deposits, according to measurements by a specially devised scratch-hardness tester. By intermittent immersion tests in 2% sodium chloride solution it is found that the corrodibility of the alloys is a minimum when the metals are in equal H. J. T. ELLINGHAM. proportions.

Deposition of nickel at a low  $p_{\rm H}$ . W. M. PHILLIPS (Trans. Amer. Electrochem. Soc., 1930, 58, 221–228).—

CL. X.-METALS; METALLURGY, INCLUDING ELECTRO-METALLURGY.

Nickel-plating from baths of  $p_{\rm H} 5 \cdot 4 - 6 \cdot 3$ , as recommended by the Bureau of Standards, has to be carried out at low current densities, and the production of deposits notably thicker than the usual  $0.8 \,\mu$  therefore takes a considerable time. It is now shown that with a bath of much lower  $p_{\rm H}$  (< 3.0) considerably higher current densities can be used without causing peeling or cracking at the edges. This increased range of permissible current density is particularly advantageous in the plating of irregularly shaped articles. Further advantages of the low  $p_{\rm H}$ bath are that turbidity of the solution is avoided and corrosion of the anodes so greatly improved that the composition of the bath is maintained without periodic addition of nickel salts. On the other hand, there is at first a greater tendency for a low  $p_{\rm H}$  bath to cause pitting, but it is believed that this disadvantage disappears when the bath has been in use for some time. Also the current efficiency of nickel deposition from such baths is lower than that from high  $p_{\rm H}$  baths, falling to about 70% at  $p_{\rm H}$  1.0. This decrease hardly affects current costs, but may result in undue building up of nickel in the bath. By replacing some of the nickel anodes by lead plates, however, this effect is easily corrected and there is the additional advantage that the lead anodes reduce the tendency to pitting. The  $p_{\rm H}$  of such baths tends to increase gradually and is more difficult to control, but this is not serious because the permissible  $p_{\mathbf{H}}$  range is very wide as compared with that of high  $p_{\rm H}$  baths. For bright nickel-plating, the low  $p_{\rm H}$ bath gives best results at low temperatures. Such baths are not suitable for plating on zinc-base die castings. Graphs are given to indicate the permissible range of current density for solutions of various  $p_{\rm H}$ values at various temperatures. H. J. T. ELLINGHAM.

Rapid determination of nickel in plating baths. A. WOGRINZ (Chem.-Ztg., 1930, 54, 967).—The solution (25 c.c. containing 0.2—0.5 g. Ni) is diluted with an equal volume of water and treated with ammonium chloride and ammonia until a pale blue colour is produced. After transferring to a 250-c.c. graduated flask, the surface of the solution is covered with a thin layer of benzine, 25 c.c. of a 10% solution of sodium sulphide are added, and the aqueous solution is diluted to the mark and filtered through a dry paper. In 100 c.c. of the filtrate the excess sulphide is determined iodometrically in the usual way. A. R. POWELL.

Practical difficulties associated with the electrodeposition of chromium. J. W. CUTHBERTSON (Electroplaters' and Depositors' Tech. Soc. Advance copy. Oct., 1930) .- The work is usually plated first with nickel, and in order that this underlayer may be quite sound and remain so during the subsequent deposition of chromium exceptionally thorough preliminary cleaning and scouring is necessary. In the deposition of chromium from a bath at  $40^{\circ} \pm 3^{\circ}$  in which the ratio, molarity CrO<sub>3</sub>: normality SO<sub>4</sub>, is about 50 or somewhat higher, the best results are obtained at 65-85 amp./ft.<sup>2</sup> Composition of the bath, current density, and temperature must be carefully controlled. Iron anodes are unsatisfactory in that their use tends to increase the concentration of tervalent chromium in the bath, thus decreasing the throwing power and narrow-

ing the range of conditions within which good deposits can be obtained. Lead is the only reliable anode material. The disposition of the anodes in the bath is important owing to the poor throwing power, but moving the work during plating causes no appreciable improvement. No attempt should be made to plate large and small work at the same time in one vat. Small articles should be wired separately, not put into a basket. Practical experiences in the plating of various types of article are given. Copper articles are best plated without a nickel undercoating, but the deposit is softer than usual and not so blue in colour.

H. J. T. ELLINGHAM.

Heat-treatment of chromium deposits to increase their resistance to corrosion. R. J. WIRSHING (Trans. Amer. Electrochem. Soc., 1930, 58, 251–254).— Heat-treatment at temperatures above 90° greatly increases the resistance to corrosion of chromiumplating directly deposited on copper, brass, or stainless steel. The resistance to corrosion of a chromium deposit on copper, as determined by the calcium chloride spray test, was increased sevenfold by treatment for  $\frac{1}{2}$  hr. at 230°. H. J. T. ELLINGHAM.

Electrodeposition of lead-thallium alloys. C. G. FINK and C. K. CONARD, JUN. (Trans. Amer. Electrochem. Soc., 1930, 58, 279-284).-A fine-grained, adherent deposit of a lead-thallium alloy containing about 30% Tl can be obtained by electrolysing a stirred perchlorate solution, containing 30 g. Tl and 5 g. Pb per litre with 20-30 g. of free perchloric acid, at 5 amp./ft.<sup>2</sup> at 25°. This alloy contains about the lowest percentage of thallium which will confer very marked acid-resisting properties. Alloys of other compositions can be obtained by varying the proportions of the metals in the electrolyte, but the actual concentration of thallium in the bath must not be much higher because the anode polarisation then becomes excessive and the cathode deposit poor. Raising the current density also causes unsatisfactory deposits. H. J. T. ELLINGHAM.

Calcium chloride testing of electroplated deposits. H. C. MOUGEY (Trans. Amer. Electrochem. Soc., 1930, 58, 265—270).—Since chromium-plated motor-car parts are often exposed to corrosion by calcium chloride used for laying dust or melting ice on roads, the introduction of a calcium chloride spray test is recommended as a guide in the improvement of chromium deposition for such service. There is no direct relation between the results of this test and those of the sodium chloride spray test, and it is not put forward as a new accelerated test of durability. H. J. T. ELLINGHAM.

Fuel oil. LUBBOCK.—See II. High-test grey iron. MORKEN. Throwing efficiency of electrolysis baths. PAN.—See XI.

See also A., Jan., 32, Iron-silicon alloys (HAUGHTON and BECKER). 33, Copper-tin alloys (IMAI and OBINATA). 41, System cobalt-chromium (WEVER and HASCHIMOTO). Carburising and graphitising reactions between iron-carbon alloys (BECKER). 47, Cathodic separation forms of tin (FOERSTER and DECKERT). 53, Oxides of iron and their reduction (RODE). 57, Electrolytic separation of antimony and copper (HÖLEMANN).

## PATENTS.

Heating furnaces suitable for metallurgical purposes. (SIR) R. A. HADFIELD and R. J. SARJANT (B.P. 338,893, 26.6.29).—The furnace is furnished (preferably by forced draught) with recuperatively heated supplies of primary air below the firebars and secondary air at some point above the fire. Control valves connected by link work and a dash pot are provided so that when the secondary supply is decreased the primary is increased, and the control may be regulated by hand or effected automatically when the fire door is opened. B. M. VENABLES.

Open-hearth furnace. B. P. WHEELER (U.S.P. 1,769,362, 1.7.30. Appl., 17.6.21).-An open-hearth furnace is provided with an auxiliary air duct connecting with the gas port to form a combined air and gas port. The passage of air is assisted by means of a blower. C. A. KING.

Centrifugal amalgamator and separator. P. A. NEUMANN (U.S.P. 1,767,893, 24.6.30. Appl., 6.9.27. Can., 18.9.26) .- The rotating drum has practically cylindrical walls surmounted by a trap in the shape of a pocket closed by a wide-meshed screen and having a cross-section like a  $\subset$ . The bottom of the basket is provided with directional vanes surmounted by a frustum of a cone the top of which is closed by a flat plate on to which the ore stream is directed by means of a vertical pipe. Mercury in a thin layer is maintained against the sides of the drum by centrifugal force and the ore stream is directed against this mercury by the cone and vanes. A. R. POWELL.

Production of metals [cast iron]. J. E. FLETCHER (B.P. 338,535, 19.8.29).-Iron ore is smelted in a large rotary furnace, and from time to time portions of the charge are transferred to a smaller rotary furnace in which it is further heated until the metal and slag are sufficiently fluid for tapping. A. R. POWELL.

Cyanide pot [for steel hardening]. V. P. RUMELY, Assr. to Hudson Motor Car Co. (U.S.P. 1,769,313, 1.7.30. Appl., 4.12.28).—The steel pots are immersed before use in a solution containing 12 lb. of iron filings, 10 gals. of phosphoric acid, and 125 gals. of hot water. When so treated the vessels have a surface coating which contains iron phosphate and the working life is increased by 50%. C. A. KING.

Annealing of crystalline substances [e.g., steel]. E. G. HERBERT (B.P. 338,511, 16.8.29).-The substance after hardening by cold-work or by quenching is further hardened by placing it in rotating magnetic field, which sets up internal alternating stresses. A. R. POWELL.

Heat treatment for hardened steel. VEREIN. STAHLWERKE A.-G. (B.P. 314,056, 27.5.29. Ger., 22.6.28).-Hardened steel is cooled below 0° to suppress elongation caused by the conversion of austenite into martensite, then reheated at 100-150° for 1-8 hrs. to suppress the contraction which takes place in the first stage of the martensite transformation.

A. R. POWELL.

Heat treatment of [high-speed tool] steel. W. B. SULLIVAN, ASST. to CHROBALTIC TOOL Co. (U.S.P. 1,766,314, 24.6.30. Appl., 2.6.26).-The steel is soaked

at a temperature between the Ac3 and Ar3 points for sufficient time to allow the transformation to go to completion, quenched, and tempered to produce the required hardness. A. R. POWELL.

Heat treatment of alloy [non-rusting] irons and steels. P. R. KUEHNRICH, and DARWINS, LTD. (B.P. 338,912, 28.8.29) .- Chromium steels containing more than 1% C, less than 1% Ni, and 1% Si are annealed at 1150-1250° in thin sheets and quenched in a solution of calcium chloride, preferably cooled below 0°; the hot metal may also be stamped into shape and cooled in the die or press. A. R. POWELL.

Stable-surface alloy steel. R. P. DE VRIES (U.S.P. 1,763,421, 10.6.30. Appl., 20.1.26).-Steel resistant to scaling up to 950° contains 1-10% Cr, 0.5-6% Si, 0.2-6% Al, 0.5-5% Cu, and 0.05-1% C. The preferred composition is 4% Cr, 2% Si, 2% Al, 1.5% Cu, and 0.36% C. A. R. POWELL.

Production of low-carbon [ferro-]alloys [containing silicon]. F. A. FAHRENWALD (U.S.P. 1,757,298, 6.5.30. Appl., 29.5.26).-A mixture of steel together with the high-carbon ferro-alloy is melted in the presence of silica, and the temperature is increased so that the affinity of oxygen becomes greater for carbon than for silicon. C. A. KING.

Changing the properties [increasing the permeability] of silicon steel. J. C. KARCHER, Assr. to WESTERN ELECTRIC Co., INC. (U.S.P. 1,752,490, 1.4.30. Appl., 4.5.28).-The steel, in the form of sheets, is annealed at 1000-1250° for 1-12 hrs., cooled to 718° at the rate of 10°/min., then rapidly cooled by placing it between two cold copper plates. (Cf. U.S.P. 1,677,139; B., 1928, 676.) A. R. POWELL.

[Inhibitor for] corrosion prevention of iron and steel [in pickling baths]. M. M. HARRISON (U.S.P. 1,766,902, 24.6.30. Appl., 14.7.28) .- A derivative of ethylenediamine, especially the s-diphenyl compound, is claimed. A. R. POWELL.

Steel sucker rod and the like and its production. W. J. CROOK, Assr. to EMSCO DERRICK & EQUIPMENT Co. (U.S.P. 1,764,068, 17.6.30. Appl., 8.1.27).--Steel containing 0.26-0.5% C and 0.5-1% Mn is annealed at 700--930° until it has an austenitic structure, then quenched in oil to produce a martensitic structure. The resulting metal has a high tensile strength, ductility, and resistance to fatigue; it is suitable for making sucker rods for oil-well pumps. A. R. POWELL.

Production of metal [copper] films [on iron and steel]. W. E. WATKINS, Assr. to COPPER PLATE SHEET & TUBE Co. (U.S.P. 1,766,417, 24.6.30. Appl., 6.1.27).-The metal to be coated is painted with a mixture of a heavy oil and finely-divided copper or copper oxide and carbon, and then heated slowly to 1000° to burn off the oil and cause the copper to sinter and adhere in a continuous film to the iron. A. R. POWELL.

Flotation process [for sulphide ores]. G. LUTZ, Assr. to Grasselli Chem. Co. (U.S.P. 1,765,308, 17.6.30. Appl., 30.1.28).-The use of an alkylnaphthalenesulphonic acid, in which the alkyl group contains at least two carbon atoms, is claimed as a frothing agent.

A. R. POWELL.

Roasting of [sulphide ore or flotation concentrate] fines. H. J. CORDY and W. J. BURGOYNE, Assrs. to GEN. CHEM. Co. (U.S.P. 1,758,188, 13.5.30. Appl., 30.1.28).—The finely-divided ores etc. are suspended in an oxidising gas and introduced into a roasting chamber into which a supplementary supply of the gas is injected adjacent to the walls to prevent "scarring" and/or the formation of accretions on the chamber walls. C. A. KING.

Concentration of oxidised ores of lead, silver, and copper. E. H. SNYDER and W. D. GREEN, Assrs. to COMBINED METALS REDUCTION CO. (U.S.P. 1,762,364, 10.6.30. Appl., 25.1.28).—Each ton of the oxidised ore is ground with 200—400 lb. of sodium chloride and 7—12 lb. of sodium sulphide and agitated in a 2:1 pulp ratio in a flotation machine with or without the addition of oil or other frothing agent. A. R. POWELL.

Treatment of refractory auriferous ores. C. L. Votaw and C. A. ANDREWS (U.S.P. 1,766,767, 26.6.30. Appl., 25.4.28).—The ore is ground wet with sodium cyanide, hydroxide, and bicarbonate, and, after drying, the mixture is smelted with lead material in the usual way. A. R. POWELL.

Brazing rod. A. R. LYTLE, Assr. to U. C. & C. RES. LABS., INC. (U.S.P. 1,764,571, 17.6.30. Appl., 7.9.28).—An alloy of 68—73% Cu, 30.75—23.5% Zn, up to 1% Sn, and 1.25—2.5% P is claimed. The alloy melts at about 800° and requires little or no flux when used for brazing brass. A. R. POWELL.

**Preparation of zinc dust.** H. A. GRINE, ASST. to GRASSELLI CHEM. Co. (U.S.P. 1,762,716, 10.6.30. Appl., 29.11.27).—Zinc is distilled in a horizontal cylindrical retort and the vapours are passed through a conical jet into a large condensing chamber filled with inert gas. The pressure in the retort forces the vapour in a powerful jet into the condenser, where it is rapidly cooled so as to produce extremely finely-divided zinc dust.

A. R. POWELL.

[Zinc] alloy. C. PACK and J. C. FOX, ASSTS. to DOEHLER DIE-CASTING CO. (U.S.P. 1,767,011, 24.6.30, Appl., 8.8.27).—A die-casting alloy containing more than 75% Zn, 1—15% Al, 1—10% Cu, and less than 5% Ni and 5% Li is claimed. The lithium prevents the disintegration of the castings on ageing or on exposure to moist atmospheres and refines the grain structure.

A. R. POWELL.

Galvanising process. C. PLETSCH (U.S.P. 1,755,559, 22.4.30. Appl., 15.5.24).—Articles are cleaned by pickling in acid, then treated with a solution containing zinc chloride, any free acid introduced being neutralised, and dried; finally molten zinc containing small quantities of aluminium and tin is applied by usual methods. C. A. KING.

Applying a metal coating to aluminium by galvanic means. M. K. DE TRAIRUP (B.P. 339,339, 3.9.29).—The aluminium article is plated at 1.5 volts for a few min. in a bath containing 10 g. of sodium hydroxide, 10 g. of sodamide, 2 g. of stannous chloride, 0.5 g. of zinc chloride, 0.25 g. of mercuric nitrate, and 0.5 g. of potassium hydroxide per litre, whereby it becomes plated with a thin uniform adherent coating

of zinc-tin amalgam on to which gold, silver, or copper can be deposited from any of the usual baths.

A. R. POWELL.

Heat treatment of wire and strip prior to galvanising or other form of surface treatment. L. D. WHITEHEAD (B.P. 339,155, 6.1.30).—The wire or strip is passed through horizontal tubes (with slightly upturned ends) containing fused metal, salts, etc. for annealing or cleaning purposes. A furnace is described in which the tubes are embedded in cast iron turnings and supported on cast iron plates which are protected by thin tiles of refractory material forming the roof of a heating flue. B. M. VENABLES.

Surface protection of magnesium alloys. R. E. Lowe, Assr. to DOHERTY RES. Co. (U.S.P. 1,765,341, 17.6.30. Appl., 14.3.27).—The alloy is cleaned with 10% nitric acid, then immersed in a 5% solution of phosphoric acid until coated with a black film, washed, and stored in a 5% solution of ammonium phosphate for 2—5 days. After washing and drying, the article is heated to obtain good adherence of the film of magnesium ammonium phosphate. A. R. POWELL.

Manufacture of aluminium. J. Y. JOHNSON. From I. G. FARBENIND. A.-G. (B.P. 338,668, 4.7.29).— A fused bath comprising 14% of sodium chloride, 6%of potassium chloride, and 80% of aluminium chloride is electrolysed at 100°, using a rotating cathode and a current density of 1 amp./dm.<sup>2</sup> Alternatively, the bath may consist of 82% of aluminium chloride and 18% of sodium chloride ; in this case a current of 4.2 amp./dm.<sup>5</sup> may be used at 160°. A. R. POWELL.

**Preserving aluminium from attack by alkalis.** G. ADOLPH (B.P. 336,854, 29.11.29).—Water glass or other alkali silicates and hydrogen peroxide or compounds which on decomposition afford hydrogen peroxide are added separately or together to alkaline solutions used in contact with aluminium.

H. ROYAL-DAWSON.

Aluminium alloy. O. KAMPS (B. P. 339,469, 25.11.29). —The alloy consists of aluminium with 0.3—1.5% Ni, 0.05—0.9% Th, and up to 6.8% of a 10% ceriumcopper alloy. The molten alloy is very fluid and can be used for making thin-walled sand castings which, after heat treatment at 535—480°, quenching in a barium chloride bath, and ageing at 50—300°, preferably 180°, have a tensile strength of over 40 kg./mm.<sup>2</sup> with an elongation of 15%. A. R. POWELL.

[Aluminium bronze] alloy. J. V. O. PALM, Assr. to CLEVELAND GRAPHITE BRONZE Co. (U.S.P. 1,764,034, 17.6.30. Appl., 1.10.26).—The alloy consists of 85—90% Cu, about 4% Al, 5—8% Zn, and 1—2% Fe.

Treatment of tin-containing material. MITSU-BISHI KOGYO KABUSHIKI KAISHA (B.P. 316,177, 27.5.29. Jap., 24.7.28).—Low-grade tin ore is mixed with pyrites and the mixture heated at 1000—1100° in a rotary kiln fired with producer gas, whereby the tin sublimes as sulphide. A. R. POWELL.

Metallurgy of tin [electrolytic reduction of cassiterite]. W. O. SNELLING (U.S.P. 1,766,463, 24.6.30. Appl., 5.3.28).—Finely-ground tin ore is subjected to an

H. ROYAL-DAWSON.

electrolytic reduction treatment, leached with a solvent for metallic tin, *e.g.*, hydrochloric acid, and again ground and leached. The second grinding operation removes films of insoluble impurities from the cassiterite particles so that these particles are freed for further reduction.

A. R. POWELL.

Preparing metal for painting. J. H. GRAVELL, Assr. to AMER. CHEMICAL PAINT CO. (U.S.P. 1,765,331, 17.6.30. Appl., 23.5.29).—The surface of the metal is rubbed with a solution of ammonium dihydrogen phosphate containing ethyl and butyl alcohols, which removes both rust and oil. A. R. POWELL.

Agent for protecting metals against the effects of frost. G. ERDBRÜGGER (B.P. 336,739, 9.9.29).—The composition consists of an intimate mixture of ground carnallite and liquid bitumen or crude mineral oil.

H. ROYAL-DAWSON.

Oxidation inhibitor [for metals]. R. S. DEAN, Assr. to WESTERN ELECTRIC Co., INC. (U.S.P. 1,764,609, 17.6.30. Appl., 12.5.24).—In order to prevent oxidation and scaling of a metal surface during heat treatment it is first sprayed or painted with a 5% colloidal suspension of boron trioxide in carbon tetrachloride peptised with 1% of 95% alcohol. The thin film of fused boron trioxide which forms during the heat treatment is adherent and impermeable to gases. A. R. POWELL.

Thoriated tungsten filament. J. H. RAMAGE, Assr. to WESTINGHOUSE LAMP Co. (U.S.P. 1,764,644, 17.6.30. Appl., 27.6.26).—A solution of ammonium tungstate and fluoride or oxalate is boiled and poured into an excess of concentrated hydrochloric acid containing thorium nitrate equivalent to the fluoride or oxalate in the tungstate solution. The resulting mixture of tungstic acid and thorium oxalate or fluoride is washed, dried, and reduced in hydrogen, and the metal is pressed into bars which are sintered, swaged, and drawn into wire.

A. R. POWELL.

Applying the basic colour of wood to metal which is then to be imprinted with the grain of the wood. MASA GES. M.B.H. ZUR HERSTELLUNG KÜNSTL. OBERFLÄCHEN (B.P. 319,283, 18.9.29. Ger., 19.9.28).— The metal surface is coppered or browned electrolytically before being printed or sprayed with the basic colour of the wood and grained.

H. ROYAL-DAWSON.

Apparatus for agglomerating and roasting minerals. A. DE SAMSONOV, ASST. to SOC. POUR L'ENRICHISSE-MENT ET L'AGGLOMERATION DES MINERAIS SOC. ANON. (U.S.P. 1,784,658, 9.12.30. Appl., 23.12.27. Belg., 4.1.27).—See B.P. 283,133; B., 1929, 58.

[Treatment of iron for manufacture of] metallic apparatus for carrying out chemical and other processes. F. LAPPE, E. KOCH, M. PIER, and H. SAUER, Assrs. to I. G. FARBENIND. A.-G. (U.S.P. 1,783,726, 2.12.30. Appl., 23.3.27. Ger., 25.3.26.).—See B.P. 293,077; B., 1928, 644.

Purification of pig iron. K. HOFMANN, Assr. to F. KRUPP A.-G. (U.S.P. 1,782,923, 25.11.30. Appl., 9.5.29. Ger., 25.5.28).—See B.P. 312,361; B., 1930, 1114.

Magnetic materials [iron-nickel alloys]. G. W. ELMEN, Assr. to WESTERN ELECTRIC Co., LTD. (U.S.P.

1,768,237, 24.6.30. Appl., 5.8.25).—See B.P. 263,207; B., 1927, 144.

[Copper-nickel-zinc] alloy. C. PHILIPPOSSIAN (U.S.P. 1,783,139, 25.11.30. Appl., 14.8.29. Switz., 3.11.28).—See B.P. 325,131; B., 1930, 332.

Recovery of tin contained in the residues of tinplate manufacture. J. LALEY, ASST. to PETITS FILS DE F. WENDEL & CIE. (U.S.P. 1,784,490, 9.12.30. Appl., 3.4.28. Fr., 23.1.28).—See B.P. 304,639; B., 1929, 288.

Improving the resistance to corrosion of magnesium and its alloys. A. BECK and G. SIEBEL, ASSIS. to I. G. FARBENIND. A.-G. (U.S.P. 1,783,770, 2.12.30. Appl., 30.1.29. Ger., 2.2.28).—See B.P. 305,197; B., 1929, 857.

Highly active [metallic] catalyst. K. MARX, H. BEHNCKE, and K. BRODERSEN, ASSTS. to I. G. FARBENIND. A.-G. (U.S.P. 1,783,662, 2.12.30. Appl., 29.11.27. Ger., 14.12.26).—See B.P. 282,410; B., 1928, 452.

Cleaning of metal surfaces. C. F. DINLEY (B.P. 340,047, 28.9.29).—See U.S.P. 1,729,765—7; B., 1930, 18.

Electrolytic apparatus for refining aluminium and for like processes. P. L. HULIN, ASST. to Soc. ANON. COMP. DE PROD. CHIM. ET ELECTROMÉTALL. ALAIS, FROGES, & CAMARGUE (U.S.P. 1,782,616, 25.11.30. Appl., 19.6.28. Ger., 4.7.27).—See B.P. 293,353; B., 1929, 290.

Electrolytic production of light metals [particularly magnesium]. C. ARNOLD. From Dow CHEM. Co. (B.P. 339,833, 11.1.30).—See U.S.P. 1,755,380; B., 1931, 29.

Apparatus for electrolytically depositing metal on metal tubes. F. G. MARTIN and W. RAMSEY, Assrs. to J. STONE & CO., LTD. (U.S.P. 1,783,885, 2.12.30. Appl., 29.9.27. U.K., 22.4.27).—See B.P. 299,100; B., 1929, 739.

Electrodeposition of metals. J. HOLLINS, ASST. to IMPERIAL CHEM. INDUSTRIES, LTD. (U.S.P. 1,782,614, 25.11.30. Appl., 22.1.29. U.K., 25.2.28).—See B.P. 314,558; B., 1929, 687.

Casting of metals [aluminium and its alloys]. BIRMINGHAM ALUMINIUM CASTING (1903) Co., LTD., and C. VAUGHAN (B.P. 339,721, 22.5.30).

Mercury boilers (B.P. 319,220 and 339,237).—See I. Fractionation of ores etc. (B.P. 318,966).—See II. Apparatus for nitric acid (B.P. 339,032). Alkali xanthates (U.S.P. 1,753,787).—See VII. Metalmelting furnace (U.S.P. 1,752,887). Contact element (U.S.P. 1,769,229). Electrodeposition of metals (U.S.P. 1,768,358). Making articles by electrodeposition (B.P. 339,428). Loaded copper conductors (B.P. 338,169).—See XI. Metallic paints (B.P. 337,682). Rust-preventive paints (B.P. 314,499). —See XIII.

## XI.—ELECTROTECHNICS.

Detroit rocking electric furnace as applied to the production of high-test grey iron. C. H. MORKEN (Trans. Amer. Electrochem. Soc., 1930, 58, 229—240).— The Detroit indirect arc furnace is described and the advantages of the rocking action in the production of

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high-test grey iron are discussed. The furnace may be used for straight cold-melting of various charges, including iron borings without briquetting, for duplexing cupola iron, and for working up cold materials such as ferro-alloys or steel scrap with molten cupola iron. Some features of these different processes are discussed in relation to the composition and properties of the product and the cost of operation. The success of this type of furnace in this field is attributed to its simplicity of operation and control and to its ability to utilise scrap material of low market value.

H. J. T. ELLINGHAM. Effect of various factors on the output of Leclanché cells. V. A. Kostjejev (Trans. Amer. Electrochem. Soc., 1930, 58, 155-172).-An investigation hasbeen made of the effect of such factors as the nature, concentration, and quantity of electrolyte, and the temperature on the output of Leclanché cells made up under identical conditions using a depolarising mix consisting of 4 pts. of Caucasian pyrolusite (91.1% MnO2) and 1 pt. of graphite enclosed in a muslin bag. The quantity of electricity furnished by a cell during discharge through an approximately constant resistance until its terminal voltage had fallen to 0.75 volt was measured in each case, and the percentage utilisation of the manganese dioxide in the cell calculated on the basis of the reaction  $2MnO_2 + H_2O = Mn_2O_3 + 2OH' + 2 \oplus$ . A "factor of quality " was obtained by multiplying this percentage utilisation by the number of amp.-min. of electricity obtained per 10 g. of depolarising mix. After remaining idle for an hour, the cell was again discharged to the same terminal voltage, and a second factor of quality calculated. Using cells with an ammonium chloride electrolyte, it was found that increasing the concentration of the solution increases the first factor of quality, the variation of the second factor being irregular, whereas increasing the volume of the electrolyte with a constant amount of depolariser raises both factors. The first factor is also increased by raising the temperature or decreasing the thickness of the depolarising mass around the carbon rod. Annealing the zinc anode had no effect. The above proportions of pyrolusite and graphite were shown to be the most advantageous. The first factor of quality is notably increased by using ammonium bromide as electrolyte and still more with the iodide. Of a number of other inorganic salts tested, only magnesium chloride gave a factor approaching that for ammonium chloride. With electrolytes containing ammonium and magnesium chlorides the factor decreased notably with increasing proportion of the latter, but the zinc was more regularly corroded and less salts were deposited. Of a large number of salts of organic acids of various types which were tried as electrolytes only ammonium salts were of any value, and of these only the tartrate gave a factor of quality exceeding that of ammonium chloride. With ammonium tartrate the utilisation of the pyrolusite is greatly improved, and the factor of quality is about three times that of a similar cell with ammonium chloride. Moreover, the zinc is more regularly corroded and no insoluble salts are formed. The probable reactions occurring in this cell are discussed. H. J. T. ELLINGHAM.

Engineering development of photovoltaic cells. Some operating characteristics. C. G. FINK I. and D. K. ALPERN (Trans. Amer. Electrochem. Soc., 1930, 58, 133-153).-An investigation has been made of the operating characteristics of cells of the type Cu,Cu<sub>2</sub>O 1% Pb(NO<sub>3</sub>)<sub>2</sub> solution | Pb, in which the coppercopper oxide electrode (the cathode) is photosensitive and the lead electrode photochemically inert. Such cells have a sensitivity of about 150 microamp./lumen. The terminal voltage of the cell with a given external resistance rises rapidly at first with increasing intensity of illumination, but tends to approach a maximum value at higher intensities. From these values of the terminal voltage, E, and the corresponding data for the current delivered by the cell, values of the apparent internal resistance, r, are calculated, and it is found that E/r is a linear function of the intensity of illumination over the range studied. The sensitiveness of the cell is a maximum for light of a wave-length about 4600 Å. H. J. T. ELLINGHAM.

Computation of throwing efficiency [of electrolysis baths]. L. C. PAN (Trans. Amer. Electrochem. Soc., 1930, 58, 255—263).—The throwing power as defined by Haring and Blum (B., 1923, 556 A) is a function of the ratio of the distances of the two cathode surfaces from the anode. A modification of this definition, suggested by Heatley, gives a quantity (now distinguished as the "throwing efficiency") which shows how near the actual throwing power for a given distance ratio approaches the ideal throwing power for this ratio. Measurements made on a cyanide cadmium bath, a nickel bath, and an acid zinc bath show that although the throwing efficiency varies much less than the throwing power with change in the distance ratio, it is by no means independent of the latter.

H. J. T. ELLINGHAM. Asphaltic bitumen. JACKSON.—See II. High-test cast iron. Moldenke. Corrosion tests of ferrous metals. PITSCHNER. Plating on radiator shells. WATTS. Iron-nickel alloys. STOUT and CAROL. Nickel-cobalt alloys. FINK and LAH. Nickel. PHILLIPS. Determination of nickel in plating baths. WOGRINZ. Chromium. CUTHBERTSON; WIRSHING. Lead-thallium alloys. FINK and CONARD. Testing of electroplated deposits. MOUGEY.—See X. Cadmium yellow. FINK and GROSVENOR.—See XIII. Electrofiltration. PURL.—See XVI.

See also A., 1931, 9, Photo-electric cells (SCHOTTKY; LANGE; TEICHMANN; IVES). 28, Ferromagnetic materials in weak alternating fields (GOLDSCHMIDT). 35, Colloid science and electrotechnics (OSTWALD). 43, Thermionic valve potentiometer (MÜLLER). 44, Gaseous combustion in electric discharges (FINCH and PATRICK). 47, Cathodic separation forms of tin (FOERSTER and DECKERT). 57, Electrolytic separation of antimony and copper (HÖLEMANN). 78, Behaviour of benzenoid hydrocarbons in the Tesla discharge (AUSTIN and BLACK).

## PATENTS.

[Carbide resistors of] electric furnaces. CAR-BORUNDUM CO., Assees. of R. C. BENNER, G. J. EASTER, and C. E. HAWKE (B.P. 338,131, 10.7.29. U.S., 7.12.28). —The life of carbide resistors is increased by operating them in a non-oxidising atmosphere, *e.g.*, by surrounding the electrodes with granular carbon.

J. S. G. THOMAS.

Induction furnace. P. H. BRACE, ASST. to WESTING-HOUSE ELECTRIC & MANUFG. Co. (U.S.P. 1,768,881, 1.7.30. Appl., 14.8.29).—A retractory crucible of the surrounded pool type has a number of intermediate axial and radial refractory walls co-operating with it to form similar and separate sections distributed peripherally within the crucible, whereby the effective length of the secondary circuit is increased. Means are provided in the walls for emptying the crucible.

J. S. G. THOMAS.

[High-frequency metal-melting] induction furnace. G. A. CHUTTER, Assr. to GEN. ELECTRIC Co. (U.S.P. 1,752,887, 1.4.30. Appl., 13.4.28).—Means responsive to variations in the power factor of the furnace are provided for varying the coupling between the primary winding of the furnace and the material to be melted, *e.g.*, by causing movement of the winding relative to the container. J. S. G. THOMAS.

Electrode and contact element [for making and breaking electric circuits]. A. J. MANDELL (U.S.P. 1,769,229, 1.7.30. Appl., 19.5.25).—A contact element made of a nickel or cobalt alloy containing 0.5—10% Si and, if desired, one or more of the elements aluminium, chromium, tungsten, zirconium, titanium, manganese, or vanadium is claimed. Thus a nickel alloy containing 0.5—10% Si and 0—5% Mn is suitable.

J. S. G. THOMAS. [Elimination of hum in] electrical transformers. H. J. CAMERON, ASST. to GEN. ELECTRIC Co. (U.S.P. 1,769,906, 1.7.30. Appl., 27.12.29).—The laminated core and coils of the transformer are impregnated with a 7:3 rosin-asphalt mixture. J. S. G. THOMAS.

(A) Detector element. (B—D) Current-rectifying devices. W. O. SNELLING (U.S.P. 1,766,461—2, 1,766,464, and 1,766,467, 24.6.30. Appl., [A] 7.3.23, [B] 14.2.27, [C] 20.9.28, [D] 31.7.29).—For rectifying purposes the use of the following is claimed : (A) An oxide of an element (at. wt. > 198) of the odd series of the fourth long period of the periodic system, e.g., litharge, at least partly reduced by sulphur. (B) A metal, e.g., copper, heated at a red heat in an atmosphere containing sulphur vapour and an inert fluid diluent, e.g., nitrogen. (c) A substantially dry lead salt, e.g., lead carbonate, reduced by an element of the sulphur group, e.g., sulphar, selenium, or tellurium. (D) A substantially dry lead salt, e.g., basic lead carbonate, reduced by a binary sulphur compound, e.g., hydrogen sulphide.

## J. S. G. THOMAS.

**Production of rectifying units.** C. E. OGDEN, Assr. to KODEL RADIO CORP. (U.S.P. 1,769,852, 1.7.30. Appl., 27.6.27).—A copper plate heated at about 1040° in an atmosphere containing oxygen and chlorine is rapidly cooled to 760° and then quenched, whereby the oxide coating is partly reduced to metal.

J. S. G. THOMAS.

Electrolytic rectifier. F. EICHENBERGER, Assr. to GLOBAR CORP. (U.S.P. 1,765,573, 24.6.30. Appl., 28.5.23. Switz., 10.6.22).—An inactive anode and a cathode composed essentially of silicon, *e.g.*, a silicon carbide core coated with silicon, are arranged in an aqueous electrolyte. J. S. G. THOMAS.

[Electrolyte for] electrolytic rectifier. E. F. LUNDEEN, ASST. to WILLARD STORAGE BATTERY CO. (U.S.P. 1,769,228, 1.7.30. Appl., 14.4.27).—An electrolytic solution containing an organic acid, a phosphate, and a small proportion of a chromate is claimed. Thus a solution containing citric acid, ammonium phosphate, potassium phosphate, potassium chromate, and, if desired, sodium benzoate is suitable. J. S. G. THOMAS.

Electrolytic process and apparatus [for electrodeposition of metals]. H. C. HARRISON (U.S.P. 1,768,358, 24.6.30. Appl., 21.5.25).-Anode and cathode are completely separated in the cell by enclosing an elongated, flexible cathode of ribbon form in a tunnellike compartment of porous, non-conducting material semi-permeable to the electrolyte and of low electrical resistance when saturated with electrolyte. The crosssection of the tunnel-like compartment conforms with, and is slightly larger than, that of the cathode. Electrolyte is forced through the cell in two distinct streams, the greater part being forced under high pressure and at high speed through the cathode compartment on both sides of the cathode, while the smaller part is forced under lower pressure through the anode compartment. Extremely high cathode current densities, e.g., 2000 amp./sq. ft., may be employed. J. S. G. THOMAS.

Making articles by electrolytic deposition of galvanoplastic metal. G. ROSENQVIST (B.P. 339,428, 24.10.29).—Apparatus comprising a lining of flexible material arranged between a mould and its supporting frame, and mould sections arranged in contact with the lining material and forming the walls of an electrolytic bath, is claimed. J. S. G. THOMAS.

Manufacture of loaded copper electrical conductors. ELECTRICAL RES. PRODUCTS, INC., Assees. of V. E. LEGG (B.P. 338,169, 14.8.29. U.S., 24.11.28).— A copper conductor is heated at about 1000° in the presence of a reducing agent, e.g., charcoal, then loaded with magnetic material, and the whole heat-treated in the absence of inert gases or other means of removing reducing gases (or materials producing such gases) which are present in the furnace or in the loaded conductor. J. S. G. THOMAS.

Condenser and material for dielectric or insulation purposes. S. BOYER, Assr. to GEN. ELECTRIC Co. (U.S.P. 1,769,874, 1.7.30. Appl., 4.12.25).— Dielectric material, e.g., paper, is impregnated with an aromatic compound, e.g., nitrobenzene, having a sp. inductive capacity of 10 and over, and a resistivity of at least 10<sup>9</sup> ohm-cm. J. S. G. THOMAS.

**Positive-ion emitter.** C. H. KUNSMAN, Assr. to A. B. LAMB (U.S.P. 1,767,218, 24.6.30. Appl., 29.9.25). —A mixture containing a positive-ion emitting substance and a promoter of the emission is claimed. Thus, *e.g.*, a mixture composed of partly or wholly reduced iron oxides, potassium oxide (about 1%), and aluminium oxide (about 1%) when heated emits potassium ions.

J. S. G. THOMAS.

Electron-emitting cathodes for electric-discharge devices. GRAMOPHONE Co., LTD., and G. B. BAKER (B.P. 339,451, 14.11.29).—A refractory core, e.g., of tungsten, or oxide-coated filament is coated with a salt, e.g., barium or cæsium tartrate, which on heating in the absence of oxygen leaves a residue containing the oxide of an electron-emitting metal and free carbon.

J. S. G. THOMAS.

[Localising alkali metal in] electric-discharge devices. BRIT. THOMSON-HOUSTON CO., LTD., Assees. of E. E. CHARLITON (B.P. 319,686,28.8.29. U.S., 26.9.28). —The anode or a carrier other than an electrode is coated with material, *e.g.*, a colloidal suspension of graphite in water, which absorbs alkali-metal vapour liberated by heating a mixture of cæsium (or rubidium) chloride and calcium in the device. J. S. G. THOMAS.

Manufacture of [gas-filled] luminescence [discharge] tubes. W. F. HENDRY, ASST. to MANHATTAN ELECTRICAL SUPPLY Co., INC. (U.S.P. 1,769,025, 1.7.30. Appl., 13.9.27).—The gas filling, *e.g.*, neon, is purified by bubbling through sodium-potassium alloy at room temperature before entering the tube.

J. S. G. THOMAS. [Slotted] collecting electrodes for use in electrical precipitation of suspended particles from gaseous fluids. LODGE-COTTRELL, LTD. From METALLGES. A.-G. (B.P. 321,869, 27.12.28).—The electrodes are provided with a series of transverse strips suspended outside their centre of gravity and connected to a displacing mechanism which moves to and fro and thus causes the strips to strike against their supporting rod. A. R. POWELL.

Apparatus for electrical separation of suspended material from gases. LODGE-COTTRELL, LTD. From INTERNAT. PRECIPITATION Co., INC. (B.P. 338,427, 14.1.30).—Curtains of rods are arranged in intersecting rows dividing the precipitator space into compartments, in each of which discharge electrodes are arranged. Means for passing gas through the compartments in a direction either parallel or transverse to the rods, and for bringing the gas into contact with the discharge and collecting electrodes, are provided. J. S. G. THOMAS.

Electric purification of gas by means of rectified alternating current of high potential. SIEMENS-SCHUCKERTWERKE A.-G. (B.P. 338,944, 1.8.29. Ger., 17.4.29).—A resistance of suitable magnitude is arranged in parallel with the filter so that, between two charging impulses, the field intensity at the discharge wires falls below that required to produce the working discharge. A resistance, the value of which is independent of the applied voltage, *e.g.*, a liquid resistance, is also arranged in parallel with the filter. J. S. G. THOMAS.

Electrical precipitation [from gases]. H. A. WINTERMUTE and C. W. J. HEDBERG, ASSTS. to RESEARCH CORP. (U.S.P. 1,766,421-2, 24.6.30. Appl., [A] 19.4.26, [B] 28.11.27).—(A) A discharge electrode extends into the gas passageway formed by spaced laminar collecting electrodes, and baffles, *e.g.*, plates spaced from one end of the walls of the passage, are arranged to produce a substantially uniform transverse distribution of flow in the passage way. (B) Gas is treated first in a "dry" section of the precipitation plant and then in a "wet" section comprising collecting electrodes flushed with liquid. J. S. G. THOMAS.

Apparatus for electrical precipitation [from gases]. W. SYKES, ASST. to NEBLETT ENG. Co. (U.S.P. 1,767,265, 24.6.30. Appl., 29.11.26).—Flues each containing a pair of negatively-charged discharge electrodes are formed by partitions constituting the positive electrodes in a casing, and gas descends through some of these flues which are closed at their upper ends, and ascends through the remaining flues. The total crosssectional area of those flues in which the gas ascends is greater than that of the remainder. J. S. G. THOMAS.

Electrical precipitating apparatus [for gases]. A. ARRAS, ASST. to INTERNAT. PRECIPITATION CO. (U.S.P. 1,767,338, 24.6.30. Appl., 3.5.28. Ger., 27.5.27).— The hollow spaces or interior chambers of the collecting electrodes are maintained under a slightly reduced pressure sufficient to prevent the formation of gas cushions or regions of increased pressure in the openings of the collecting surfaces leading in to the hollow spaces. J. S. G. THOMAS.

Electric furnace. A. IMBERY, Assr. to GLOBAR CORP. (U.S.P. 1,784,670, 9.12.30. Appl., 8.10.28. U.K., 10.10.27).—See B.P. 303,222; B., 1929, 177.

Production of magnetic cores. K. EISENMANN and F. BERGMANN, Assrs. to I. G. FARBENIND. A.-G. (U.S.P. 1,783,560—1, 2.12.30. Appl., 18.3.29. Ger., 30.3.28).—See B.P. 320,611 and 319,854; B., 1930, 21.

[Introducing potassium, cæsium, or rubidium into electric] discharge tubes. J. H. DE BOER and P. CLAUSING, ASSTS. to N.V. PHILIPS' GLOEILAMPEN-FABR. (U.S.P. 1,767,437, 24.6.30. Appl., 18.10.26. Holl., 12.12.25).—See B.P. 264,258; B., 1927, 226.

[Attaching and operating the] electrodes of electric furnaces and electrolytic vats. P. GIROD, Assee. of A. FRANCHINI (B.P. 338,371, 20.11.29. Fr., 27.8.29).

Production of anodes for cells of electric dry batteries. W. SCHMIDT (B.P. 339,881, 17.2.30. Ger., 21.3.29).

Manufacture of [helical] filaments for electric lamps. WESTINGHOUSE LAMP CO., Assees. of S. WADSTEN and C. W. HUNT (B.P. 339,803, 20.12.29. U.S., 29.12.29).

Electric discharge tubes with rare-gas fillings. A. LEDERER (B.P. 314,864, 25.6.29. Austr., 3.7.28. Addn. to B.P. 306,831).

Mixing systems (B.P. 338,123). Dispersal of fog (B.P.339,295).—See I. Measuring the calorific value of gases (U.S.P. 1,767,771). Bituminous preparations (B.P. 339,470). Deoxidiser for insulating oils (U.S.P. 1,736,464).—See II. Acetylene and hydrogen (B.P. 337,088).—See III. Coating of conductors (U.S.P. 1,764,625).—See V. Aluminium chloride (U.S.P. 1,752,936). Furifying rare gases (U.S.P. 1,753,298).—See VII. Coating of vitreous articles (U.S.P. 1,752,792).—See VIII. Cement kiln (B.P. 316,715).—See IX. Annealing steel (B.P. 338,511). Plating aluminium (B.P. 339,339). Aluminium (B.P. 338,668). Tin (U.S.P. 1,766,463). Tungsten filament (U.S.P. 1,764,644). Applying the grain of wood to metal (B.P. 319,283).—See X. Fertilisers (B.P. 337,402).—See XVI. Treatment of latty substances for ointments etc. (B.P. 316,264).—See XX.

## XII.—FATS; OILS; WAXES.

Bleaching of linseed oil. ANON. (Farben-Ztg., 1930, 36, 595-596).—A general account of the decolorising of linseed oil is given, reference being made to the various processes used, the importance of temperature and time of contact with the bleaching agent, and the tendency to re-darken. The last-named is attributed to excessive temperature and pressure at filtration, the presence of acid, and the use of poor-quality filter paper.

## S. S. WOOLF.

Detection of castor and arachis oils in "Abrasinol." H. WOLFF and J. RABINOWICZ (Farben-Ztg., 1930, 36, 596—597. Cf. Stock, B., 1930, 1162).—The determination of solubility in alcohol and of acetyl value are recommended for determining castor oil in this connexion. Arachis oil can generally be determined by measurement of refractive index, but conclusive information is obtained by isolating the fatty acids and separating the arachis oil acids from elæostearic acid by fractional crystallisation or fractional precipitation of the magnesium salts. S. S. WOOLF.

Vitamins-A and -D in fish oils. E. M. NELSON and J. R. MANNING (Ind. Eng. Chem., 1930, 22, 1361—1363). —Commercial grades of sardine (*i.e.*, pilchard), menhaden, Alaska herring, salmon, Maine herring, and tuna oils were tested by feeding experiments on rats. With respect to vitamin-A, salmon oil is as potent as lowgrade and only one third as potent as high-grade codliver oil. Sardine, Alaska herring, and tuna oils are one tenth as potent as good medicinal cod-liver oil. With respect to vitamin-D, the relative potencies are : codliver oil (good medicinal) 100, tuna 125, sardine 100, menhaden 75, salmon 50, Alaska herring 30, Maine herring 15. At current prices, some of these commercial oils are cheaper sources of vitamins than is cod-liver oil. W. J. BOYD.

## Soya-bean oil meal. ROBISON.-See XVI.

See also A., Jan., 62, Unsaponifiable matter from oils of elasmobranch fish (DAVIES and others; also HEILBRON and WILKINSON, p. 80). 63, Synthetic mixed triglycerides (BHATTACHARYA and HILDITCH). 111, Pig-stomach fat (HEPBURN and TREXLER). 131, Oil in Para rubber seed (IWAMOTO).

#### PATENTS.

Cleansing and working of [butter or like] fats. R. BENDLIN and O. URBASCH (B.P. 338,053, 2.1.30. Austr., 9.1.29).—The fat is divided into fine threads by extrusion from a vernicelli press and is further comminuted by jets of the cold liquid washing medium which removes impurities. The fat particles are separated by settling and centrifuging. E. LEWKOWITSCH.

Production of scouring compositions. W. J. A. HUYZER (B.P. 337,355, 26.7.29. Cf. B.P. 335,005; B., 1930, 1097).—Mixtures of magnesite (about 50-mesh) and soap powder are claimed. H. ROYAL-DAWSON.

Apparatus for degreasing materials [by volatile solvents]. IMPERIAL CHEM. INDUSTRIES, LTD., and

F. E. ROGERS (B.P. 337,770, 1.8.29).—Mechanical interconnecting devices, controlled by a common handle, are devised, so that the heating means (e.g., in the plant described in B.P. 278,891; B., 1927, 946) can be brought into operation only when the cooling means are in action and the lid of the degreasing vessel is locked down.

Apparatus for recovering fats from emulsions containing solid particles. J. A. L. ROZIÈRES, ASST. to Soc. FRANÇ. DE CENTRIFUGATION (U.S.P. 1,782,974, 25.11.30. Appl., 16.7.28. Fr., 11.10.27).—See B.P. 289,350; B., 1928, 456.

Apparatus for separating fat or other material from gases. G. W. F. CATLIN (U.S.P. 1,784,418, 9.12.30. Appl., 8.1.29. U.K., 3.2.28).—See B.P. 311,204; B., 1929, 565.

Pure glycerin (B.P. 336,608). Polyhalogenated fatty acids (B.P. 336,623).—See III. Treatment of fatty substances for ointments etc. (B.P. 316,264). —See XX.

## XIII.—PAINTS; PIGMENTS; VARNISHES; RESINS.

"Chalking " [of paints]. III. R. KEMPF (Farben-Ztg., 1930, 36, 553-555; cf. B., 1930, 1119).—The question of whether chalking is to be regarded as a favourable or unfavourable manifestation of paint films is discussed, with full references to the literature. Excessive chalking early in the life of a film is undesirable, but slight and regular chalking at advanced film-age may be advantageous. Where retention of gloss and resistance to rubbing are essential chalking is a drawback, but this is not so in the case of white paints required to maintain their colour, nor in that of interior paints not subjected to rubbing. The relation between chalking and durability is not yet established.

S. S. WOOLF. Micrography of coloured pigments. II. Red oxides of iron. ANON. (Farben.-Ztg., 1930, 36, 597— 599).—A summary of the methods adopted and results obtained by H. Wagner and H. Pfanner in their work on the microscopical, chemical, and physical properties of a range of 30 natural and artificial iron oxides. (Cf. B., 1930, 1119; 1931, 33.) S. S. WOOLF.

Electrolytic production of cadmium yellow. C. G. FINK and W. M. GROSVENOR, JUN. (Trans. Amer. Electrochem. Soc., 1930, 58, 271—277).—An electrolytic method of preparing cadmium sulphide of suitable colour for use as a pigment has been investigated. The cathode compartment of a diaphragm cell contains a steel shaft fitted with iron discs which acts as cathode and rotates in dilute sulphuric acid containing finely-ground ferrous sulphide in suspension. Rods of electrolytic cadmium are arranged around the outside of the cathode compartment and dip into a dilute acid solution which forms the anolyte. On passing the current cadmium sulphide is precipitated just outside the diaphragm with a current efficiency approaching 100%, and a slime of metallic iron is deposited on the cathode. H. J. T. ELLINGHAM.

"Run" amber. I. C. PLONAIT (Farben-Ztg., 1930, 36, 555-556).—The process of "running" amber is described, five chief grades differing in colour being obtained. The constants of these are tabulated : acid

E. LEWKOWITSCH.

values 12-24 (cf. run copal, 52-90), saponif. values 19-54, ash content below 0.1%. S. S. Woolf.

Asphaltic bitumen. JACKSON.-See II.

See also A., Jan., 78, Behaviour of benzenoid hydrocarbons in the Tesla discharge (AUSTIN and BLACK). 81, Acenaphthene resins (MORGAN and HARRISON). 89, Constituents of kawa root (BORSCHE and others). 94, Resin acid of the *isosylvic* acid group (ASCHAN). [Resin from] autoxidation of piperitone in alkaline solution (TREIBS).

## PATENTS.

[Metallic] paints. BRIT. THOMSON-HOUSTON Co., LTD., Assees. of L. V. ADAMS (B.P. 337,682, 11.1.30, U.S., 11.1.29).—Suspensions of finely-divided metal, *e.g.*, aluminium or zinc, in volatile solvent solutions of resinous condensation products of polybasic acids, polyhydric alcohols, drying oils, fatty acids derived therefrom, and rosin are claimed. S. S. WOOLF.

[Rust-preventive] paints. CONSORT. F. ELEKTRO-CHEM. IND. G.M.B.H. (B.P. 314,499, 26.6.29. Ger., 28.6.28).—The use of polyvinyl acetates in alcohol or benzene solution as vehicles for such paints is claimed.

S. S. WOOLF.

Binding compounds for painting purposes. A. ROGLER (B.P. 337,523, 5.9.29).—Drying or semi-drying oils are heated at 100—150° with 10—30 wt.-% of zinc oxide, titanium oxide, or other suitable metal oxide until a semi-solid mass is obtained. This is dissolved in solvents, and pigments, resins, etc. are incorporated if desired. Rapid hardening is claimed. S. S. WOOLF.

Manufacture of non-caking pigmented coating compositions. E. I. DU PONT DE NEMOURS & Co. (B.P. 312,061, 6.5.29. U.S., 18.5.28).—A protective agent adapted to inhibit caking of pigment, *e.g.*, rubber in colloidal solution in petrol, is deposited on pigment particles before, during, or after grinding the pigment in the vehicle. This treatment is particularly suitable for use with cellulose ester compositions containing damar gum. S. S. Woolf.

Compositions and processes for removing coating material from coated surfaces. H. WADE. From J. H. GRAVELL (B.P. 337,461, 2.8.29).—Painted surfaces are treated with a hot aqueous solution of an alkali hydroxide and a phenol, *e.g.*, cresylic acid (preferably present to the extent of 25% of the weight of alkali hydroxide), and subsequently washed with a highpressure stream of water. Residual alkalinity is removed by treatment with dilute acid, *e.g.*, phosphoric acid.

S. S. WOOLF.

Paint and varnish remover. N.C.W. PAINT & VARNISH REMOVER CO., LTD., and T. K. BONNAR, JUN. (B.P. 337,944, 19.10.29).—Quicklime is covered with soft soap and water, the mixture stirred, sodium carbonate, ammonium carbonate, and sodium thiosulphate are successively added, and the product is stirred and allowed to cool and thicken. H. ROYAL-DAWSON.

Manufacture of [pencil] leads, crayons, and chalks. A. and P. PISCHEL (B.P. 337,633, 27.11.29).— A sulphonated fatty oil, *e.g.*, Turkey-red oil, is added to the usual mass of clay (or loam) and graphite, before or during kneading and pressing. H. ROYAL-DAWSON.

Making pyroxylin solutions of low viscosity. H. HIBBERT and J. L. PARSONS, ASSTS. to HAMMERMILL PAPER Co. (U.S.P. 1,768,253, 24.6.30. Appl., 8.6.26).— Before nitration, cellulose is subjected to oxidation by suspending it in a slightly alkaline or slightly acid solution of potassium permanganate or a peroxide or chromate at 22—26°, and then washed with sodium bisulphite solution and water. W. J. WRIGHT.

Manufacture of resinous condensation products. VARNOL CHEM. CORP. (B.P. 315,870, 11.7.29. U.S., 21.7.28).—A phenol-aldehyde or -ketone condensation product (made preferably in presence of solvent such as turpentine, drying or non-drying oils, natural or synthetic resins, ester gums) is dehydrated at 120° and heated with a glycerol abietate (or other resinous glyceride containing free alcoholic groups) until all volatile matter is driven off at about 300°. The phenolic groups are thus etherified and the products are neutral resins of high m.p. suitable for varnishes. C. HOLLINS.

Manufacture of artificial masses. J. Y. JOHNSON. From I. G. FARBENIND. A.-G. (B.P. 337,806, 6.8.29).— Polymerised vinyl alcohols are treated with aliphatic aldehydes, *e.g.*, formaldehyde or trioxymethylene, or with substances furnishing them, *e.g.*, acetals, in the presence of acid catalysts, such as mineral acids, aluminium chloride, sodium bisulphate; heat and/or pressure may be applied, if desired. A subsequent vulcanisation improves the product, especially if insaturated aldehydes, *e.g.*, acraldehyde, have been used. S. S. WOOLF.

Production of urea-aldehyde resins. W. W. TRIGGS. From TOLEDO SCALE MANUFG. Co. (B.P. 337,357, 27.4.29).—Urea is heated with excess of formaldehyde in a slightly acid solution, and the residue of formaldehyde is combined in stages by the addition of urea in suitably diminishing quantities, the  $p_{\rm H}$  value of the solution during these initial condensations being controlled by additions of a strong organic base which does not react with formaldehyde, *e.g.*, triethanolamine. The solution is then concentrated, polybasic acid-polyhydric alcohol condensation products are added, and the mixture is further concentrated, to give moulding powders etc. S. S. WOOLF.

Incorporation of "alkyd" resins into drying oils. BRIT. THOMPSON-HOUSTON CO., LTD., Assees. of R. H. KIENLE (B.P. 316,319, 27.7.29. U.S., 27.7.28).— Drying oil fatty acids are heated with a polyhydric alcohol, *e.g.*, glycerol, in chemical excess, until a homogeneous product is obtained, a drying oil is added, the solution is stirred until clear, and the product is resinified by addition of a polybasic acid, *e.g.*, phthalic anhydride. Alternatively, the drying oil is introduced into a mixture of the remaining constituents in a stage of incomplete resinification, and resinification is then completed.

S. S. WOOLF.

Synthetic resins and compositions containing them. BRIT. CELANESE, LTD. (B.P. 315,807—8, 18.7.29. U.S., 18.7.28).—(A) Benzenesulphonamide or (B) xylenesulphonamide is condensed with an aldehyde (formaldehyde), preferably in presence of catalyst, to give a resin, which is incorporated with cellulose derivatives (acetate) for lacquers, plastics, or adhesives for non-splintering glass. C. HOLLINS. Manufacture and use of synthetic resins. BRIT. CELANESE, LTD. (B.P. 338,002 and Addn. B.P. 338,024, [A] 18.11.29, [B] 5.12.29. U.S., [A] 17.11.28, [B] 5.12.28). —Toluenesulphonamide-aldehyde (e.g., formaldehyde) condensation products, produced if desired by reacting in the presence of 5—10% of urea and removing excess of reactants, are condensed (A) with a toluenesulphonamide and the resin so obtained is heated at 160—200° for 4—8 hrs., to give a benzene-insoluble resin suitable for use in lacquers, films, adhesives, etc., or (B) with an aldehyde, e.g., formaldehyde, and subsequently heated, to yield benzene-soluble products. S. S. WOOLF.

**Preparation of talking-machine records.** A. O. THOMAE (B.P. 337,437, 1.7.29).—Gelatinised acetylcellulose with camphor or camphor substitutes is dried at  $40-80^{\circ}$  for 24 hrs. per 0·1 mm. of thickness, the material is rendered fluid by heat or by dissolution, *e.g.*, in acetone, and sprayed or brushed on a matrix bearing a sound record, and the coated matrix is heated to  $60-90^{\circ}$ under a pressure of about 200 atm. S. S. WOOLF.

Manufacture of sound records. DURIUM PRODUCTS CORP., Assees. of H. T. BEANS (B.P. 337,796, 5.7.29. U.S., 2.4.29).—Resorcinol, preferably ground, is dissolved in heated formaldehyde and stirred at 70—75° until suitable viscosity is attained, volatile solvent (alcohol), abrasive (rouge), and plasticiser (glycerin) are introduced, and the product is bonded to a resilient support, e.g., paper-stock sheet, and dried. Tone-grooves are then impressed on the surface by use of a die heated to 160°, polymerisation of the surface material occurring in about 1 min. [Stat. ref.] S. S. WOOLF.

Resinous condensation product. A. H. V. DURR, Assr. to COMP. NAT. DE MAT. COL. ET MANUF. DE PROD. CHIM. DU NORD RÉUNIES, ETABL. KUHLMANN (Re-issue 17,878, 25.11.30, of U.S.P. 1,739,447, 10.12.29).—See B., 1930, 625.

Adhesive composition. W. O. HERRMANN and W. HAEHNEL, ASSIS. to CONSORT. F. ELEKTROCHEM. IND. (U.S.P. 1,784,008, 9.12.30. Appl., 9.5.27. Ger., 11.5.26). —See B.P. 271,090; B., 1928, 793.

Polyhalogenated fatty acids (B.P. 336,623). Naphthazarin derivatives (B.P. 316,950). Azo pigments (B.P. 336,938).—See IV. Solvent extraction of wood (U.S.P. 1,762,785).—See V. Coating materials from asphalt etc. (B.P. 337,521).—See IX. Preparing metal for painting (U.S.P. 1,765,331).— See X.

## XIV.—INDIA-RUBBER; GUTTA-PERCHA.

Use of asphalts and bitumens on [rubber] estates. H. SUTCLIFFE (Rubber Res. Inst. Malaya, 1930, 2, 113— 124).—Fluid mixtures of asphaltum with kerosene or various proprietary fungicides are suitable for wound treatment of rubber trees. The penetration of the mixtures is so low, even with young tissue, that it permits the use of ingredients which by themselves would be quite unserviceable on account of their excessive penetration. D. F. Twiss.

Bacteriology of *Hevea* latex. A. S. CORBET (Rubber Res. Inst. Malaya, 1930, 2, 139-155).—Several new species of micro-organism from *Hevea* latex are described. One of these, viz., *Micrococcus epimetheus*, affects both acidification and flocculation of latex; it may be a frequent cause of bubble-formation in sheet rubber, but its action in this direction can be inhibited by preventing the  $p_{\rm H}$  of the coagulating tank from exceeding  $4 \cdot 4$ . D. F. Twiss.

Coagulation of *Hevea* latex. R. G. FULLERTON (Rubber Res. Inst. Malaya, 1930, 2, 156–181).—The behaviour of latex of various concentrations, of pasteurised latex, of latex preserved with ammonia, sodium hydroxide, or formalin, and of the "cream" and "skim" obtained from latex by centrifugal action, with respect to the occurrence of two successive coagulation zones on progressive decrease of  $p_{\rm H}$ , has been examined with the aid of the quinhydrone electrode. D. F. Twiss.

The lipin of *Hevea* latex. E. RHODES and R. O. BISHOP (Rubber Res. Inst. Malaya, 1930, 2, 125—135).— The serum from the alcoholic coagulation of latex, when concentrated and extracted with ether, yields a product resembling the plant-lipin complexes; its chemical and physico-chemical properties are described. D. F. TWISS.

Effect on vulcanisation of the lipin of *Hevea* latex. B. J. EATON, E. RHODES, and R. O. BISHOP (Rubber Res. Inst. Malaya, 1930, 2, 136—138; cf. preceding abstract). —The addition of *Hevea* lipin to alcohol-coagulated rubber, "slab" rubber, or pale crêpe rubber causes an increase in the rate of vulcanisation, which, however, is very slight in the last case. The effect of lecithin on vulcanisation is considerably greater than that of the lipin, but both cause a peculiar crumbling of the rubber during the earlier stages of the mixing operation.

D. F. Twiss.

Hot-air vulcanisation. Development of its technical practice. P. BREDEMANN (Gummi-Ztg., 1930, 45, 375—376, 413—416, 458—462, 502—503).—A description is given of various types of plant and equipment for the vulcanisation of different articles, such as footwear and rubbered textile material, in heated air.

D. F. Twiss.

Mechanical properties of rubber in compression at low temperature. W. D. DOUGLAS (India-rubber J., 1930, 80, 899-901).—Investigation of the effect of temperatures down to -50° on the stress-strain characteristics of rubber in compression shows that, with comparatively high initial rates of loading to equal maximum loads, rubber at low temperatures absorbs a greater amount of energy than at normal temperatures.

D. F. Twiss.

Standardisation of testing of rubber with ozone. E. P. W. KEARSLEY (Kautschuk, 1930, 6, 244-249).— An apparatus and method are described for securing standard conditions in the exposure of rubber samples  $3 \text{ in.} \times 0.5 \text{ in.} \times 0.1 \text{ in.}$  for 30 min. to an atmosphere containing 1 pt. of ozone in 50,000 pts. The test-pieces were maintained at the intended extension for 3 days before exposure to the special atmosphere, and were subsequently examined for surface-cracking at a standard stretch of 100%. With increase in the degree of extension of the exposed sample the cracks were smaller, but their number rapidly increased with extension up to 10%, at which the surface was covered with cracks ("maximal crack formation"). If the period of stretch before exposure was increased, the point of maximal crack formation moved towards a higher degree of stretch. The nature and number of the cracks were not seriously influenced by the concentration of the ozone for any one degree of extension, although it affected the depth of the cracks. Over-vulcanisation only slightly affected the formation of cracks; under-vulcanised rubber showed less tendency to cracking, probably on account of the greater plasticity. Alteration of the degree of humidity did not affect the results, but increase of temperature from 15° to 70° approximately halved the time, this result being attributable to the greater tendency of the stretched rubber to retract when heated. With increasing proportions of zinc oxide up to 30 vols. on a mixture of rubber (100 pts.), sulphur (3 pts.), zinc oxide (5 pts.), and mercaptobenzthiazole (0.5 pt.), the extension necessary for maximal crack formation was increased up to 30%. From comparative tests on the effect of zinc oxide, natural whiting, and carbon black on the same mixing, it is shown that decreasing particle size and consequent increased permanent set lead to increase in the degree of extension at which maximal cracking D. F. Twiss. results.

Importance of the theory of the main-valency chain for knowledge of the structure of rubber. E. LINDMAYER (Kautschuk, 1930, 6, 249–252).—The characteristic features of rubber are attributed to its molecular structure comprising a straight or needleshaped main-valency chain with free terminal valencies. This view is supported by analogy with other natural products such as starch, and it explains many of the phenomena observed with natural rubber, such as its anisotropy and the effects of vulcanisation. The inferiority of synthetic rubbers is ascribed to polymerisation yielding *cis*-configurations in the molecule instead of the desired elongated chain of valencies. D. F. Twiss.

See also A., Jan., 38, Structure viscosity of caoutchouc solutions (DOGADKIN and PEWSNER). 93, Action of nitric acid on caoutchouc (GORGAS). Isoprene and caoutchouc (STAUDINGER and others). 131, Oil and lipase-like enzyme in Para rubber seed (IWAMOTO).

## PATENTS.

Purifying and concentrating [rubber] latex. W. B. WESCOTT, Assr. to RUBBER LATEX RES. CORP. (U.S.P. 1,754,535, 15.4.30. Appl., 28.12.27).-Latex is first submitted to centrifugal force (cf. U.S.P. 1,630,411; B., 1927, 610) sufficient, however, to remove only coagulated particles exceeding 5  $\mu$  in diam. The separated coarse cream is washed with water and the washings are added to the refined latex. After introducing an agent, e.g., carragheen, capable of accelerating creaming, the refined latex is again centrifuged, but with such intensity as to yield a concentrated latex and a rubberfree serum. The concentrated latex while still under centrifugal force is washed with a solution of a protective colloid such as hæmoglobin so as to displace all the natural serum and to nullify the effect of any residual separation-accelerating agent. The proportion of carragheen for maximum acceleration is about 0.5%, and the amount permissible in latex capable of stable re-dispersion is about 0.05%. It is desirable initially

to clarify the carragheen solution by centrifuging, and convenient to introduce it when washing the "coarse cream" in the first stage. D. F. Twiss.

Dispersed vulcanised rubber. W. C. GEER and H. L. TRUMBULL, Assrs. to B. F. GOODRICH CO. (U.S.P. 1,754,886, 15.4.30. Appl., 13.6.25. Renewed 15.9.28).— Vulcanised rubber plasticised with the aid of a rubber softener, such as 30% of kerosene, is intimately mixed on a tight mill with a colloidal emulsifying paste, *e.g.*, an aqueous paste of casein and sodium carbonate. The resulting pasty emulsion is diluted with water and then treated in a colloid mill until the particle size is reduced to approximately that of natural rubber latex.

D. F. Twiss.

Preparation of dispersions containing rubber and manufacture of waterproof fibrous materials therewith. N.V. BATAAFSCHE PETROLEUM MAATS., Assees. of L. KIRSCHBRAUN (B.P. 315,839, 17.7.29. U.S., 19.7.28).—A hot plastic mixture of rubber and bituminous material, such as asphaltum or coal-tar pitch, is mixed in a kneading or masticating machine at 70—93° with a relatively stiff paste of colloidal clay. The rubber mixture gradually becomes dispersed in the aqueous paste. Clay of the bentonite type will disperse in this way 5—20 times its weight of rubber-bitumen mixture. For the manufacture of waterproof fibrous materials, a diluted mixture of the dispersion with fibres is felted on a papermaking machine.

D. F. Twiss.

Manufacture of coloured articles from dispersions of rubber and the like. DUNLOP RUBBER Co., LTD., D. F. TWISS, E. A. MURPHY, and R. G. JAMES (B.P. 338,303, 11.10.29).—Articles formed from aqueous dispersions of rubber, e.g., by dipping, are coloured by incorporating in the original dispersions, or applying to the surface while still wet, substances capable of reacting with another chemical agent, applied later, with formation of the desired pigment. E.g., a wet, shaped deposit from latex containing β-naphthol may be immersed in a diazo solution ; a wet freshly-formed deposit may be immersed wholly or partly in a solution of indigo-white and then exposed to air; shaped latex deposits coagulated with the aid of an aluminium salt or an acid, respectively, may be immersed in a hot solution of alizarin or in an alkaline sulphide solution of a sulphur dye. D. F. Twiss.

Manufacture of caoutchouc-like masses. J. BAER (B.P. 314,524, 13.6.29. Switz., 29.6.28).—A solution of an alkali or alkaline-earth sulphide or polysulphide is caused to react with unsaturated halogen derivatives of unsaturated hydrocarbons, *e.g.*, isoprene.

H. ROYAL-DAWSON.

Preservation of [rubber] latex. K. SCHUSTER and H. HOPFF, Assrs. to I. G. FARBENIND. A.-G. (U.S.P. 1,783,057, 25.11.30. Appl., 6.4.28. Ger., 20.4.27).—See B.P. 289,022; B., 1928, 533.

Manufacture of rubber goods from rubber dispersions. P. KLEIN and A. SZEGVARI, ASSIS. to AMER. ANODE, INC. (U.S.P. 1,783,435, 2.12.30. Appl., 13.4.27. Hung. and Ger., 14.4.26).—See B.P. 269,505; B., 1927, 853.

Use of mono- and di-carbalkoxydiarylthioureas

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as accelerators in the vulcanisation of rubber. C. J. T. CRONSHAW and W. J. S. NAUNTON, ASSTS. to BRIT. DYESTUFFS CORP., LTD. (U.S.P. 1,782,842, 25.11.30. Appl., 27.10.26. U.K., 1.3.26).—See B.P. 264,682; B., 1927, 230.

Adhesive [from rubber emulsion]. G. S. MATHEY, Assr. to JOHNSON & JOHNSON (U.S.P. 1,784,740, 9.12.30. Appl., 3.6.27).—See B.P. 286,527; B., 1928, 378.

Polymerised diolefines (B.P. 337,019).—See III. Materials for road construction etc. (B.P. 337,521). —See IX. Non-caking pigments (B.P. 312,061).—See XIII.

## XV.—LEATHER; GLUE.

Effect on gelatin and dehaired skin of the salts of the lyotropic series and the counteracting influence of tanning materials. G. GRASSER, H. OHOKI, and V. HIRAKAWA (J. Fac. Agric. Hokkaido, 1930, 23, 165-176).-In low concentration none of the salts had a measurable effect on the m.p. or shrinkage temperature, but a liquefying concentration exists for each salt. The minimum liquefying concentration for anions tollowed approximately the order of the Hofmeister series, decreasing from phosphate to thiocyanate; a similar, but not identical, series was obtained by determining the minimum concentration of salt having an appreciable effect on the shrinkage temperature of skin. Lithium, calcium, barium, and strontium lowered the shrinkage temperature. The m.p. of gelatin tanned with formaldehyde was not lowered by salts; the m.p. of that tanned with chromium was lowered only by salts having a stripping action. Solutions of potassium thiocyanate, bromide, or iodide, or of lithium chloride liquefied vegetable-tanned gelatin; these salts and sodium nitrate liquefied gelatin tanned with benzoquinone, methylal, acetaldehyde, and paraldehyde. For gelatin tanned with bromine, the m.p. increased with increasing concentration of lactate, acetate, and fluoride; it was unaffected or decreased with increasing concentration of other salts. Similar, but specifically different, effects were exhibited by the same salts on iodine-tanned gelatin or iodine- or bromine-tanned skin.

#### CHEMICAL ABSTRACTS.

(1) Test for sulphite-cellulose extract. (2) Application of ultra-violet rays to tannery chemistry. G. GRASSER (J. Fac. Agric. Hokkaido, 1930, 23, 151—156).—(1) The extract (10 c.c. diluted to 50 c.c.) is rendered alkaline with sodium hydroxide, boiled for 10 min., with stirring, in a dish, acidified with sulphuric acid (20%), again boiled, cooled, and filtered. The filtrate is extracted with ether (5 c.c.); the extract is treated with alcoholic phloroglucinol (1%, 1 c.c.) and concentrated hydrochloric acid (2 c.c.). In presence of sulphite-cellulose extract a red colour, due to the presence of vanillin, is developed. (2) Characteristic fluorescence is observed with variously tanned leathers. The condensation of phenolsulphonic acid or  $\beta$ -naphthol with formaldehyde is accelerated by ultra-violet light.

CHEMICAL ABSTRACTS. Paper adhesives. SHAW and others.—See V.

See also A., Jan., 96, Tannins from kola nuts (FREUDENBERG and OEHLER). 131, Carboxylic tannins (REICHEL). Presence of tannins in flowers (IONESCO).

## PATENTS.

Manufacture of leather. L.MELLERSH-JACKSON. From LEATHER MAKERS' PROCESS Co. (B.P. 339,138, 23.12.29).— The wet skins are struck out, placed on a drying board, and the marginal portions of the skin affixed to the latter by means of adhesive fabric strips. D. WOODROFFE.

Treatment of fur. C. D. PARKS (U.S.P. 1,766,452, 24.6.30. Appl., 8.5.25).—Fur-bearing skins are immersed in an almost boiling solution of a suitable acid, *e.g.*, sulphuric, which is agitated and cooled by a current of air, and then the loosened fur fibres are separated from the decomposed skin. D. WOODROFFE.

Lecithin preparations (B.P. 317,730).-See III.

## XVI.—AGRICULTURE.

Laws of soil colloidal behaviour. III. Isoelectric precipitates. S. MATTSON (Soil Sci., 1930, 30, 459-495: cf. B., 1929, 904; 1930, 72).-The preparation of isoelectric precipitates of iron and aluminium "hydroxides" from the respective sulphates and chlorides is described. Hydroxides obtained from the sulphates are isoelectric at a lower  $p_{\rm H}$  than those from the chlorides. The sulphate content of the former was higher than the equivalent chloride content of the latter. Addition of phosphate or silicate ions to the sesquioxide complex lowers the isoelectric  $p_{\rm H}$  by displacing both the diffusible acid ions and the hydroxyl ions. The smaller the phosphate- or silicate-ion concentration of the solution used the greater is the relative proportion entering the complex. With solutions of high concentration the complex tends to approach, but does not attain, saturation (i.e.,  $P_2O_5/Al_2O_3 = 1$  and  $SiO_2/Al_2O_3 = 3$ ), provided cations forming insoluble phosphates and silicates are absent and colloidal silica is not precipitated. All ions in the system mutually displace one another according to their respective energies. At the isoelectric point a small number of diffusible anions are always in combination in the complex. The adsorptive surface layer of both crystalline and natural colloids changes constantly with external conditions. Hence a stoicheiometric relationship between any two ions in the system is impossible. There is, however, a balance between the anions and cations in the system. The bearing of the above on observed variations in the nature of soil colloids of different climatic zones is discussed.

## A. G. POLLARD.

Electrofiltration : a method of removing exchangeable bases from soil colloids. A. N. PURI (Soil Sci., 1930, 30, 413—419).—Two arrangements are described. Electrofiltration affords a satisfactory means of pretreating soils for mechanical analysis. Results so obtained agree with those for soils treated by the author's methods using sodium chloride + sodium hydroxide (B., 1929, 1026) and 0.5N-hydrochloric acid (B., 1928, 796). A. G. POLLARD.

Oxidation of pyrites and sulphur [in soils] as influenced by lime and magnesia—a 12-year lysimeter study. W. H. MACINTIRE, W. M. SHAW, and J. B. YOUNG (Soil Sci., 1930, 30, 443—457. Cf. B., 1923, 1036 A, 1143 A; 1924, 27, 345).—Quicklime, magnesia, limestone, and dolomite increased the amount of sulphates leached from soil in lysimeter experiments, but with dressings equivalent to 2000 lb. of lime per 2 million lb. of soil the outgo of sulphate was always less than that supplied in rainfall. Differences in the effects of lime and magnesia on the rate of leaching of sulphate from soils treated with sulphur, pyrites, and ferrous sulphate indicate that the micro-organisms causing the oxidation of organic soil-sulphur and elementary sulphur differ from those concerned in the oxidation of pyrites. The incomplete recovery of sulphate from soils treated with sulphur, pyrites, and ferrous sulphate in certain instances is ascribed to the formation of insoluble sulphates and to the reduction of sulphates. Both lime and magnesia decreased the outgo of potash from untreated soils and from those receiving sulphur additions. The outgo of nitrate was decreased by the sulphur treatments, but supplementary treatment with lime or magnesia more than counterbalanced this effect. Light dressings of magnesia increased the nitrate outgo more than equivalent lime dressings, but the reverse was the case with heavy applications. A. G. POLLARD.

Influence of inorganic nitrogen compounds on reaction and replaceable bases of Norfolk sand. R. M. BARNETTE and J. B. HESTER (Soil Sci., 1930, 30, 431-437).-The acidity of permanent lawn-grass plots on the sandy soil examined was increased by continuous treatment with ammonium sulphate and to a smaller extent by ammonium phosphate, but was decreased by sodium nitrate. A top dressing of 3 in. of clay reduced this effect with both ammonium salts. The increased hydrogen-ion concentration of the soil following ammonium sulphate treatment was proportional to the amount of sulphate applied and was correlated with the decrease in the total replaceable cation equivalents. Ammonium sulphate decreased the replaceable bivalent cation content to a greater extent than the univalent cation content, and a replacement of univalent cations by bivalent cations in the lower depths of the soil was indicated. A. G. POLLARD.

Effect of organic matter on several physical properties of soils. L. D. BAVER (J. Amer. Soc. Agron., 1930, 22, 703-708).—The presence of organic matter increases the absorptive capacity of the soil for cations from 30 to 60%. and for water from 20 to 40%; it also raises both upper and lower plastic limits. Oxidation of the organic matter increases the percentage of clay. CHEMICAL ABSTRACTS.

Sorptive properties of peats in the light of Freundlich's adsorption formula. A. MUSIEROWICZ (Rocz. Nauk Roln. Les., 1929, 21, 129—152).—The sorption of the ions Ca'', K',  $NH_4$ ', and  $PO_4$ ' by Dublany and Mizun peats follows Freundlich's formula; differences are recorded. Fertilisation of the high-land peat with calcium increases the adsorption of potassium and ammonium. CHEMICAL ABSTRACTS.

Nitrogen and organic matter in Hawaiian pineapple soils. A. L. DEAN (Soil Sci., 1930, 30, 439-442). The C: N ratio of the soils examined averaged 7:1 (cf. Jenny, B., 1929, 407). A. G. POLLARD.

Preparation of soil samples for pipette analysis. E. WINTERS, JUN., and M. B. HARLAND (J. Amer. Soc. Agron., 1930, 22, 771—780).—Air-dried soil (10 g.) is stirred during 1 hr. with 0.1N-hydrochloric acid (200 c.c.),

kept overnight, filtered, and washed with suction. It is then shaken for 48 hrs. with 0.11% sodium carbonate. CHEMICAL ABSTRACTS.

Soil sampler. L. J. PESSIN (Science, 1930, 72, 459– 460).—A sampler which enables a cylinder of soil of any desired length to be obtained from soils free from gravel or rock is described. L. S. THEOBALD.

Mechanical analysis as an indicator of the impermeability in connexion with the dispersion of soils. T. SAWARENSKY (Mat. Op-Stroj racob. Mughan, 1929; Proc.Internat. Soc. Soil Sci., 1930, 5,160—163).—Methods usually adopted for the preparation of a soil sample for mechanical analysis aim at obtaining maximum dispersion of the material, and for this reason do not give information as to the natural condition of the soil and its permeability to water. A method of aggregate rather than ultimate analysis for this purpose is desirable.

A. G. POLLARD.

Microbiological soil analysis. T. BAUMGÄRTEL (Landw. Jahrb., 1930, 71, 593—614).—Recent progress in the adaptation of microbiological methods to soil analysis is discussed, with special reference to Beijerinck's *Azotobacter* method. A. G. POLLARD.

Nutritive value of Polish phosphorites as fertilisers. H. Sowińska (Rocz. Nauk Roln. Les., 1929, 21, 1—18).—Comparative tests revealed no marked differences between five different phosphorites. Yields of oats (grain and straw) are recorded. CHEMICAL ABSTRACTS.

Availability of phosphates [as fertilisers]. S. D. CONNER (Amer. Fertiliser, 1930, 72, No. 8, 16—18).— Average yields of barley for seven crops showed little difference in the relative availability of various insoluble phosphates when the phosphoric acid was applied alone and fixed by the soil, or fixed first by treatment with an excess of any one of several basic compounds. The availability of superphosphates is not adversely affected by admixture with calcium carbonate or with aluminium or iron silicate. CHEMICAL ABSTRACTS.

Effect of artificial fertilisers on soil reaction. S. T. JENSEN (Tidsskr. for Planteavl., 1929, 35, 380; Bied. Zentr., 1930, 59, 538—539).—A survey of changes in soil reaction and lime requirement as revealed by continuous fertiliser trials. A. G. POLLARD.

Application of the colorimetric determination of phosphoric acid in Neubauer's seedling method K. PFEILSTICKER (Z. anal. Chem., 1930, 82, 276-284).-Neubauer's method for the determination of small quantities of phosphoric acid in plants or soils is modified as follows : the material is ignited to destroy organic matter and the residue digested with nitric acid to convert the phosphorus compounds into orthophosphoric acid; 1 c.c. of the solution is pipetted into 100 c.c. of water. The diluted solution is treated with 4 c.c. of molybdate solution (made by diluting a mixture of 200 c.c. of 10% ammonium molybdate solution and 200 c.c. of sulphuric acid to 1 litre) and 4 c.c. of stannous chloride solution (made by diluting a solution of 0.25 g. of tin foil in 5 c.c. of hydrochloric acid to 120 c.c.). After shaking for 15-20 min., the colour is compared in a Duboscq colorimeter with that of standards prepared in the same way.

A. R. POWELL.

Influence of plants on the water and nutrient

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relationships of soils. V. DENISSIVSKI (Landw. Versuchs-Stat. Kiev, 1929, No. 28; Bied. Zentr., 1930, 59, 546-547).-Comparison is made of the effects of the growth of oats, peas, and potatoes on the nutrient contents of a strongly podsolised loam. The reduction in nitrate content of the soil after cropping was greatest with oats and least with potatoes. The withdrawal of water by the crop is one of the causes of retardation of nitrification in the soil. Cropping did not appreciably affect the water-soluble phosphate content of the soil. The water-soluble calcium content was greatest under peas and least under potatoes. The ammonia content of soil under peas and oats was smaller than in fallow soil, ammonification being retarded by the lowered moisture content of the cropped land. Towards the middle of the growth period the [water-soluble ?] potash content of the cropped soils decreased. From spring to summer the water-soluble humus increased in both cropped and fallow soils. Variations in the nitrate and calcium contents of the subsoil during winter were directly related to the amounts of these nutrients present in the late spring. In fallow soil and potato plots the  $p_{\rm H}$ increased, partly as a result of increased nitrification. The decrease in moisture content of the cropped soils was in the order, potatoes < peas < oats.

## A. G. POLLARD.

Relation of ash constituents of pasture plants to the oxidation-reduction potentials of nutrients. H. P. COOPER and J. K. WILSON (Soil Sci., 1930, 30, 421-430).-Changes in the mineral constituents of the herbage occurring during depletion of the soil are recorded. Nitrogen- and silica-free ash contents of grasses decrease with soil depletion. Elements with relatively high standard electrode potentials (e.g., K and Ca") frequently predominate in plant ash. A strong negative correlation exists between the calcium and potassium contents of the ash of grasses. A correlation is suggested between the qualitative order of removal of metallic cations from soil colloids by electrodialysis and the order of the energy of removal, in equivalent volts, of the inmost normal valency electron of elements. Many organisms differentially absorb atomic nutrient cations in the same qualitative order as they are removed from soil colloids by electrodialysis. High nutrient demands by plants for optimum growth are associated with intolerance of shade and high feeding value, and vice versa. The quality of radiant energy necessary for the reduction of common nutrient ions varies considerably, phosphorus being one of the most difficult to reduce. Ionic phosphorus is more easily reduced than phosphorus in the molecular form. A. G. POLLARD.

Crop rotation experiments. F. MÜNTER (Z. Pflanz. Düng., 1930, 9B, 529-552).—The yield of and nutrient intake by crops during numerous rotations is recorded. Sugar beet removed a greater proportion of nutrients from soils than any other crop examined, and was followed, in order, by potatoes and oats. Nitrogen deficiency following root crops was especially apparent in roots, oats, and barley, after oats in potatoes, and after wheat in roots. Phosphate deficiency was observed only in peas after roots. The best preparatory crops were, in decreasing order, legumes, potatoes, and sugar beet.

A. G. POLLARD.

Effect of manganese, copper, zinc, boron, and arsenic on growth of oats. J. S. McHARGUE and O. M. SHEDD (J. Amer. Soc. Agron., 1930, 22, 739-746).— Addition of small quantities of copper and zinc, as compared with manganese, increased the yield of straw and grain, whilst boron and arsenic decreased the yield of grain. CHEMICAL ABSTRACTS.

Effect of fertilisers on yield and composition of wheat. H. F. MURPHY (J. Amer. Soc. Agron., 1930, 22, 765—770).—Phosphate (especially when combined with potash), but not nitrogen and/or potash, increases the yield of wheat on Kirkland sandy loam. The protein content of the wheat increases as the nitrogen is increased, but falls when phosphate is added.

CHEMICAL ABSTRACTS.

Effect of climate on nitrogen content of maize, barley, and red clover. E. J. DELWICHE and W. E. TOTTINGHAM (J. Amer. Soc. Agron., 1930, 22, 681—688).— Clover contains more protein when grown in South than in North Wisconsin; with hay and cereals no differences were observed. CHEMICAL ABSTRACTS.

Influence of hydrogen-ion concentration on the development and growth of buckwheat. L. S. KACHIONI-VALTER (Bull. Sta. Plant Acclim. Detskoje Selo [Russia], 1927, No. 5, 73—96).—Buckwheat is very sensitive to hydrogen ions. In presence of chloride ion favourable development was obtained at  $p_{\rm H} 5 \cdot 0 - 6 \cdot 5$  and injury was observed at  $p_{\rm H} 7 - 9$ . The influence of chloride depends on the  $p_{\rm H}$ ; in its absence the optimal range diminished. CHEMICAL ABSTRACTS.

Rate of intake, accumulation, and transformation of nitrate nitrogen by small grains and Kentucky bluegrass. M. M. McCool and R. L. Cook (J. Amer. Soc. Agron., 1930, 22, 757-764).—The intake by plants of nitrogen added to the soil can be detected in the expressed sap after 15 hrs. Changes of concentration of nitrate nitrogen in the soil are proportional to the changes in the sap. Ammonium sulphate, urea, and ammonium dihydrogen phosphate are slower than is sodium nitrate in affecting the nitrogen content of the sap. CHEMICAL ABSTRACTS.

Phosphorus content of grassveld. M. HENRICI (Farming in S. Africa, 1930, 5, 29-30).—South African pasture grasses are low in phosphorus content; those in Bechuanaland contain more than those in the East Transvaal highveld. In the former the minimum value occurs during the summer drought, and in the latter in winter. CHEMICAL ABSTRACTS.

Potash demand of grasses and leguminosæ. J. WEIGEET and E. HILTNER (Ernähr. Pflanze, 1930, 26, 172—175; Chem. Zentr., 1930, ii, 294).—Grasses react chiefly to nitrogen and leguminosæ to potash; leguminosæ exert a large demand on the soil potash. A. A. ELDRIDGE.

Control of celery blights. J. D. WILSON and A. G. NEWHALL (Ohio Agric. Exp. Sta. Bull., 1930, No. 461, 30 pp.).—Celery blight was controlled by spraying with a 5:5:50 Bordeaux mixture or dusting with a 1:4 mixture of monohydrated copper sulphate and slaked lime. Copper dust mixtures containing copper in any other form were inferior. The admixture of inert materials (e.g., kaolin, fuller's earth), while improving

adhesiveness, did not add to the toxicity of the A. G. POLLARD.

Dicalcium phosphate as a mineral supplement for dairy cows. C. C. HAYDEN, C. F. MONROE, and C. H. CRAWFORD (Ohio Agric. Exp. Sta. Bull., 1930, No. 455, 26 pp.).—Significant differences in the daily or total milk production of cows due to the feeding of dicalcium phosphate were not observed where rations included legume hay with a grain mixture.

## A. G. POLLARD.

Soya beans and soya-bean oil meal for pigs. W. L. ROBISON (Ohio Agric. Exp. Sta. Bull., 1930, No. 452, 42 pp.).—Pig-feeding trials show that a mineral salt supplement to soya-bean meal is necessary. Cooked beans gave better results than uncooked. Good-quality soya-bean meal (after oil extraction) used as a supplement to maize in pig rations was superior to the whole beans, but the quality, digestibility, and palatability of the meal varied considerably with the process of manufacture. Soft pork fat may result from feeding soyabean oil or whole beans. The meal, having a lower oil content and correspondingly higher protein content, does not produce this effect. A. G. POLLARD.

Mechanical analysis of natural phosphates. ALEXANDER and JACOB.—See VII. Asphalts and bitumens on rubber estates. SUTCLIFFE.—See XIV.

See also A., Jan., 132, Influence of inorganic ions on seeds (KURBATOV; GLÜCKMANN). 133, Determination of acid-base balance in ash of plants (FREAR). Cause of "wildfire" in tobacco (BÖNING). Rust diseases of cereals (TERÉNYI).

#### PATENTS.

Fertilisers. C. VILAIN (B.P. 336,651, 15.7.29).— Dolomite is treated with free phosphoric acid and the double phosphate produced is acted on by ammonia.

H. ROYAL-DAWSON.

Manufacture of compound fertilisers and sodium bicarbonate. Soc. CHIM. DE LA GRANDE-PAROISSE, AZOTE ET PROD. CHIM. (B.P. 338,007, 19.11.29. Fr., 11.1.29. Addn. to B.P. 331,451; B., 1930, 924).—The double decomposition reaction (of the prior patent) between the potassium chloride and sodium nitrate is modified by effecting it in the mother-liquors of the process. Thus these salts may be added to the solution at that point in the manufacture at which the precipitation and separation of the bicarbonate have already taken place. H. ROYAL-DAWSON.

Manufacture of (A) concentrated, (B) [mixed], fertilisers. A. HOLZ and T. V. D. BERDELL (B.P. 337,402 and 337,415, 30.7.29).—(A) Chlorine, prepared together with potassium hydroxide and hydrogen by the electrolysis of potassium chloride solution, is passed simultaneously with sulphur dioxide into water to yield a mixture of sulphuric and hydrochloric acids which is used to convert calcium phosphate into calcium sulphate, calcium chloride, and phosphoric acid; after filtration of the solution, the residual calcium sulphate is converted by treatment with the electrolytic potassium hydroxide solution and carbon dioxide into potassium sulphate and calcium carbonate, the latter being collected and the filtrate treated with sufficient calcium

hydroxide to precipitate dicalcium phosphate, which is removed, washed, and mixed with the potassium sulphate solution. The mixture is concentrated, granulated by spraying into warm air, and mixed with, e.g., ammonium nitrate. (B) Potassium chloride is treated below 200° with sufficient sulphuric acid to yield potassium bisulphate and to expel all the chlorine as hydrogen chloride, which is used for decomposing phosphatic ores in aqueous suspension with the formation of calcium chloride and phosphoric acid. After filtration the solution is treated with sufficient calcium hydroxide to precipitate the phosphoric acid as dicalcium phosphate, which is removed, dried at about 100°, and added to a mixture of potassium and ammonium sulphates prepared by treating the potassium bisulphate with am-L. A. COLES. monia.

Fumigating compound and its production. K. F. COOPER, ASST. to AMER. CYANAMID Co. (U.S.P. 1,754,148, 8.4.30. Appl., 24.5.23).—A mixture of 2—9 pts. of an inert material and 1 pt. of a cyanide, such as the crude material described in U.S.P. 1,359,257 (B., 1921, 9 A), capable of evolving gaseous hydrocyanic acid in presence of moisture is applied to the infected area as a dust. The inert diluent aids the uniform distribution of the cyanide and prevents damage, *e.g.*, to the foliage of plants, which should also preferably be dry. If desired, an arsenical powder may also be employed capable of exerting a toxic effect after the escape of the hydrogen cyanide. The rate of application is 20—55 lb./acre. C. JEPSON.

Fungicidal product for seed treatment. C. S. REDDY, ASST. to QUAKER OATS CO. (U.S.P. 1,760,000, 27.5.30. Appl., 17.3.28).—Furan derivatives (e.g., furfuraldehyde, hydrofuramide) are combined with mercury compounds after incorporation with an inert filler (e.g., tale). A. G. POLLARD.

Dressing seed. H. Rössner, A. STEINDORFF, and K. PFAFF, Assrs. to FARBW. VORM. MEISTER, LUCIUS, & BRÜNING (U.S.P. 1,783,200, 2.12.30. Appl., 8.10.25. Ger., 15.10.24).—See B.P. 241,568; B., 1927, 88.

## XVII.—SUGARS; STARCHES; GUMS.

Uba cane juice; [un-]trustworthiness of the Clerget method. E. HADDON (S. African Sugar J., 1930, 14, 379).—Acidification with acetic acid of cloudy (lead-clarified) Uba cane juice causes further cloudiness due to an organic compound of silica. The Clerget method of analysis is inapplicable. The juice (100 c.c.) is boiled under reflux for 4 min. with barium hydroxide (2 g.); when cool it is treated with acetic acid (1 c.c.), lead-clarified, and polarised. CHEMICAL ABSTRACTS.

Determination of the actual sugar content of filter-press cakes. L. SHNAIDMAN (Nauk Zapiski Tzuk. Prom., 1930, 9, 161-166).—The cake is conveniently diluted with hot water, the calcium compound being decomposed with acetic acid.

## CHEMICAL ABSTRACTS.

Determination of invert sugar, particularly in presence of much sucrose. G. BRUHNS (Deut. Zuckerind., 1930, 54, 1237, 1316—1317, 1337—1338; 55, 422 —423, 486—487; Chem. Zentr., 1930, ii, 323).—Copper solution (10 c.c.), sodium potassium tartrate-sodium hydroxide solution (10 c.c.), and sugar solution (20 c.c.) are well mixed in a 200-c.c. flask, heated rapidly, and boiled for exactly 2 min. over a small flame. During the heating a small quantity of finely-powdered talc is scattered over the surface of the liquid, which is not agitated. After addition of 50 c.c. of aerated distilled water the mixture is cooled to 15°; a solution of potassium thiocyanate (0.65 g.) and iodide (0.10 g.) and, after agitation,  $5 \cdot 5N$ -sulphuric acid (10 c.c.) are added and thiosulphate is run in until (in presence of starch) the precipitate is dark yellow to red and the liquid no longer becomes grey or blue in 5 min. A blank determination is performed with water instead of sugar solution. The difference corresponds with the copper precipitated. If the sugar solution contains substances which react with iodine, its "iodine titre " is determined instead of its " copper titre " by treatment of the coppertartrate-sugar mixture with 50 c.c. of aerated distilled water without boiling, cooling to 15°, and titrating as above with thiosulphate. A. A. ELDRIDGE.

Paper adhesives. SHAW and others.—See V. Temperature changes in sugar solutions. JOSLYN and MARSH.—See XIX.

See also A., Jan., 47, Inversion of sucrose by platinised charcoal saturated with hydrogen (BRUNS and WANJAN). 67, Mésquite gum (ANDERSON and OTIS).

#### PATENTS.

Diffusion plant [for sugar beet etc.]. C. CAMUSET (U.S.P. 1,782,603, 25.11.30. Appl., 30.8.26. Fr., 25.9.25). —See B.P. 258,849; B., 1927, 664.

Manufacture of crystalline dextrose. W. B. NEW-KIRK, Assr. to INTERNAT. PATENTS DEVELOPMENT Co. (U.S.P. 1,783,626, 2.12.20. Appl., 9.6.26).—See B.P. 254,729; B., 1927, 122.

## XVIII.—FERMENTATION INDUSTRIES.

Degree of fermentation. J. DE CLERCK (Bull. trimestr. Assoc. anc. Elèves Brass. Louvain, 1930, 30, 1-19; Chem. Zentr., 1930, ii, 324).—A discussion of differences in behaviour between fermentations in the vat and those in the flask. A. A. ELDRIDGE.

Ester value, strength, and quality of rums and arracks. H. WÜSTENFELD and C. LUCKOW (Mitt. Abtg. Trinkbranntwein- u. Likörfabr. Inst. Gärungsgewerbe, Berlin, 1930, 20, 2—6; Chem. Zentr., 1930, i, 3838).—The ester values of 83 rums lay usually between 200 and 800, but values up to 3000 were recorded; values for 23 arracks varied from 230 to 470. The requirements of control analysis are discussed. A. A. ELDRIDGE.

Dough fermentation. KARACSONYI and BAILEY.-

See also A., Jan., 61, Preparation of anhydrous alcohol and detection and determination of water in alcohol (ADICKES). 122, New enzymic oxidation [metaoxidase] (BOAS). 124, Determination of peptic activity (GILMAN and COWGILL).

## PATENTS.

Distillation and rectification of alcohol. E. A. BARBET (B.P. 338,569, 16.5.29).—Fermented wines are distilled and subjected to two successive rectifications, the second of which is effected by using only the heat from the vapours from the distilling column. A greater economy of steam is obtained by carrying out the second rectification in a vacuum, the vacuum rectifier being heated by the vapours from the top of the first rectifier, and using the vapour from the distilling column solely for heating the primary rectifier. C. RANKEN.

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Preparation of acetylmethylcarbinol and diacetyl [by fermentation]. T. H. VERHAVE, SEN. (B.P. 337,025, 26.6.29. Addn. to B.P. 315,264; B. 1930, 1044).— In the process of the prior patent the aeration, insufficient to prevent formation of  $\beta\gamma$ -butylene glycol during fermentation, is continued until the glycol is oxidised. C. HOLLINS.

Determining the degree of saturation of materials after immersion (B.P. 338,282).—See I. Food composition (B.P. 318,522).—See XIX.

## XIX.—FOODS.

Colloid chemistry of gluten. III. H. L. B. DE JONG and W. J. KLAAR (Cereal Chem., 1930, 7, 587-591; cf. B., 1930, 787).—When an acid solution of gliadin is diluted with acetone-water mixtures of varying concentration of acetone and the viscosity determined, a maximum value is obtained with a mixture containing 44 vol.-% of acetone. E. B. HUGHES.

Relation of the overgrinding of flour to dough fermentation. L. P. KARACSONVI and C. H. BALLEY (Cereal Chem., 1930, 7, 571—587).—Samples of overground wheat flour showed a marked increase in diastatic activity, due probably to the easier accessibility of the starch. No substantial effect was apparent in the dough fermentation, and the gas production and gas retention were not appreciably altered. E. B. HUGHES.

Relation between crude protein content and loaf volumes obtained by two different methods of baking. R. H. HARRIS (Cereal Chem., 1930, 7, 557-570).-A large number of samples of hard red spring wheat were milled experimentally and subjected to baking tests by the standard and bromate-and-malt methods. Increase in loaf volume was found to correspond with increase in protein content in loaves baked by the latter method. Where the increase in volume over the standard method was greater than 10% the sample was rebaked with malt and arkady, and greater increases were obtained. On mathematical analysis the results showed that the coefficients of correlation between baking strength and protein content obtained appeared to justify Larmour's conclusion (B., 1930, 583) that commercial use of the protein test is justified as a factor in the classifica-E. B. HUGHES. tion of hard red spring wheat.

Utility of protein peptisation by inorganic salt solutions as a means of predicting loaf volume. W. F. GEDDES and C. H. GOULDEN (Cereal Chem., 1930, 7,527-556).—Gortner's method (B., 1929, 262) for determining the peptisation of wheat protein by inorganic salt solutions has been applied to a large number of flours experimentally milled from hard red spring wheat and including immature and frosted wheat. Baking tests by the standard and bromate-and-malt methods and protein determinations were also made on all samples. From a mathematical analysis of the results, and of those

obtained by Gortner and by MacLeod, it was concluded that, on the whole, the total protein value was a better measure of quality than the percentage of protein peptised. E. B. HUGHES.

Clarification of milk for American Cheddar cheese. G. WILSTER (Iowa State Coll. J. Sci., 1930, 4, 181—213).—Effects of various methods of clarification of milk on the bacterial numbers and quality of cheese produced are examined. A. G. POLLARD.

Does nickel dissolved from the container during pasteurisation catalyse the destruction of the vitamins of milk? A. D. PRATT (J. Nutrition, 1930, 3, 141—155).—Pasteurisation in a nickel container introduced nickel (15 in 10<sup>6</sup>) into milk. Pasteurisation in a glass or nickel container did not appreciably destroy vitamin-A. The antineuritic factor of the vitamin-Bcomplex and vitamin-C were partly destroyed, but there was no evidence of catalysis of the destruction by nickel. CHEMICAL ABSTRACTS.

Testing sweetened condensed milk by a modified Babcock method. W. D. SWOPE (Ice Cream Trade J., 1930, 26, No. 8, 53—54).—In the Babcock method, 9 g. of a 1 : 1 mixture of water and sweetened condensed milk are mixed with concentrated ammonia solution (2 c.c.), butyl alcohol (3 c.c.), and sulphuric acid (d 1.73; 17.5 c.c.). CHEMICAL ABSTRACTS.

Large-scale experiments in sulphuring apricots. E. M. CHACE, C. G. CHURCH, and D. G. SORBER (Ind. Eng. Chem., 1930, 22, 1317-1320).-Experiments have been made on a semi-commercial scale to investigate the effect of concentration, temperature, and period of sulphuring on the grade of the fruit and on the proportion of sulphur dioxide retained by it. Fruit from one district and during one season only was used. A method of grading devised for the experiments is Boxes having a capacity of 1000 litres of described. air-space and capable of holding 20 kg. of fresh fruit were used, these boxes being thermally controlled and equipped with mixing fans. Although the greater part of the absorption takes place in the first  $\frac{1}{2}$  hr., periods of less than 2 hrs. give unreliable results at concentrations below 3%. Concentrations above 3% lead to too great retention of sulphur dioxide; 2% concentration may be used if the sulphuring period is 3 hrs. at least, but concentrations below 2% are unreliable. Temperatures below 26° would probably lead to retarded absorption, but above 50° the fruit may develop a reddish or cooked appearance. W. J. BOYD.

Carbon dioxide storage of fruits, vegetables, and flowers. N. C. THORNTON (Ind. Eng. Chem., 1930, 22, 1186—1189).—The fruit etc. was held in storage for from 2 to 7 days, and the tolerance to carbon dioxide at six different temperatures (32—77°) recorded. For some fruit ripening was retarded; pears were improved in flavour. Flowers in bud kept longer owing to later opening of the bud. Data are given for the common commercial fruits and vegetables and for a number of flowers. E. B. HUGHES.

Heat transfer in foods during freezing and subsequent thawing. I. Temperature changes in sugar solutions, sweetened fruit juices, and other liquids. M. A. JOSLYN and G. I. MARSH (Ind. Eng. Chem., 1930, 22, 1192—1197).—When solutions containing sugar were cooled in air in an apparatus of a refined technical type, the temperature changes during freezing and thawing indicated that the process was one of conduction, and that convection was important only in the later stages of thawing. The viscosity of the sugar solutions apparently had very little effect and the chief factors affecting the rate of change in temperature were the sp. heat, the heat conductivity, the temperature of the first formation of ice, and the percentage of water present as ice. There is no simple relationship between the percentage of sugar present and the cooling rate. E. B. HUGHES.

Vitamins-A and -D in fish oils. NELSON and MAN-NING.—See XII. Soya beans for pigs. ROBISON.— See XVI.

See also A., Jan., 39, Binding materials in cooking (ZIEGELNAYER). 119, Toxic action of baking-powders containing alum (CERIOTTI).

#### PATENTS.

Flour and dough. J. DAPPER (B.P. 335,214, 19.6.29). —The baking property of flour or dough is increased by adding to the materials a mixture of persulphates and bromates, any tendency to evolve bromine thereby being prevented by the further addition of magnesium or calcium carbonate. H. ROYAL-DAWSON.

Food composition and its production by fermentation. P. L. MUSAE (B.P. 318,522, 4.9.29. U.S., 4.9.28).—A mixture of carob-bean and soya-bean flours is added to the dough of any fermented bakery product. The carob is rich in natural sugar which is released slowly during fermentation and the soya supplies protein, the result being to increase lactic fermentation and restrain the formation of butyric and acetic acids.

E. B. HUGHES.

Stabilisation of cereal beverages. D. Cozzo-LINO (U.S.P. 1,766,428, 24.6.30. Appl., 16.7.27).—The undesirable proteins of cereal beverages containing less than 0.5% of alcohol may be removed by the addition of 1—3 pts. of tannin and 2—6 pts. of silicious clay to 50,000 pts. of the beverage. After 5 days the precipitate may be filtered off, when the beverage will be found not to change in appearance on chilling or pasteurising. E. B. HUGHES.

Filter of active adsorptive composition for freeing infusions of coffee from caffeine and roasting toxins. W. Päffgen (B.P. 339,543, 31.1.30. Ger., 18.9.29).—Coffee infusions are filtered through paper containing small amounts of highly active carbon. E. B. HUGHES.

Production of liquid food. C. BAUER, ASST. to VET. PRODUCTS LABORATORY, INC. (U.S.P. 1,766,590, 24.6.30. Appl., 17.4.28).—Cows' milk is modified for the use of young animals (puppies and the like) by the addition of lactic acid and sugar. E. B. HUGHES.

Evaporators for milk etc. (B.P. 334,355). Grinder (U.S.P. 1,768,713). Determining the degree of saturation of materials after immersion (B.P. 338,282). Sterilisation of liquids (B.P. 338,422).—See I. Lecithin preparations (B.P. 317,730).—See III. Working of butter etc. (B.P. 338,053).—See XII. Determination of quinine in tabloids and ampoules. E. J. EMMANUEL (Z. anal. Chem., 1930, 82, 296— 297).—The material is extracted with light petroleum to remove paraffin and the residue is dried, powdered, and digested with 50 c.c. of 1% hydrochloric acid at  $50-60^{\circ}$ . The clear solution is treated with 20 c.c. of 10% sodium hydroxide solution and the quinine removed by three extractions with 20 c.c. of chloroform. The resulting quinine solution is evaporated to dryness and the residual quinine weighed after heating to constant weight at 100°. A. R. POWELL.

Oil of amber. T. T. COCKING (Perf. Ess. Oil Rec., 1930, 21, 477-478).—The analyses of a large number of samples of "Oleum succini rect." from three different English distillers indicate that the constants of these oils are very variable, especially the boiling range, and it is suggested that the Codex specification be replaced by the following:  $d \ 0.850-0.875$ ,  $\alpha \ -12^{\circ}$  to  $+12^{\circ}$ ,  $n^{20}$  1.465—1.482, solubility in 90% alcohol 1 in 5—6 vols. Oil prepared from genuine amber chippings had : d 0.935,  $\alpha + 20^{\circ}$ ,  $n^{20} 1.5155$ , acid value 13.0, ester value 2.0, saponif. value 15.0, boiling range below  $150^{\circ}$  nil,  $150-200^{\circ}$  15%,  $200-250^{\circ}$  17%,  $250-300^{\circ}$  43%, and it is shown from an examination of the products of distillation of ordinary colophony that distillation at a high temperature followed by careful fractionation is necessary to produce the oil known commercially as oil of amber. E. H. SHARPLES.

Three oil-bearing grasses from Burma. D. RHIND (Agric. J. India, 1930, 25, 327–329).—Three species of *Cymbopogon* grass are described *C. clandestinus*, Stapf., on distillation gives 0.26% of oil (on dry grass) and *C. nov. spec.* a yield of 0.72% (for analyses cf. B., 1930, 166). Both oils have odours resembling that of ginger-grass oil. *C. virgatus*, Stapf., *nov. spec.*, on distillation gives 0.55% of an oil with an unpleasant odour having  $d^{15} 0.9556$ ,  $\alpha$  (100-mm. tube) —28° 53',  $n^{20}$ 1.49107, acid value 1.9, ester value 6.5, ester value after acetylation 72.8, alcohol content (as  $C_{10}H_{17}$ ·OH) 21.2%. E. H. SHARPLES.

See also A., Jan., 28, Periodates [of alkaloids] (ROSENTHALER). 55, Determination of orthophosphate ion (DEL CAMPO). 66, Bacterial oxidation of oxalates (SCHOLDER). 82, p-Aminophenylguanidine hydriodide (BRAUN). 88, Reactions of salicylic acid and salol (EKKERT). 94, Reactions of g- and kstrophanthin (EKKERT). 99, Reaction of antipyrine and pyramidone (RIBÈRE). 106, New sulphur derivatives of aromatic arsenicals (EVERETT). 119, Assay of strophanthin solutions (FASCHING). 120, Assay of aconitine solutions (BRANDT). 126, Pituitary gland preparations (ABEL). 127, Bovine parathyroid gland preparations (TWEEDY). 128, Technical insulin and its crystalline preparations (BÜRGER and KRAMER). 132, Paraffins of tobacco (KURILO). Microanalytical tobacco determinations (BODNAR and others). 133, Cause of "wildfire" in tobacco (BÖNING).

## PATENTS.

Increasing the biological value of fatty substances in ointments and like external therapeutic agents. O. RIED (B.P. 316,264, 25.7.29. Austr., 26.7.28).—Fatty substances in ointments, creams, etc., either alone or mixed with other substances, are mixed with powdered metals or metal oxides previous to irradiation with ultraviolet light or X-rays. E. H. SHARPLES.

Manufacture of ether derivatives of aminobenzoic alkamine esters [tert.-aminoalkyl aminoalkoxybenzoates. Local anæsthetics]. Schering-Kahl-BAUM A.-G. (B.P. 317,296, 12.8.29. Ger., 10.8.28).— The presence of a nuclear alkoxyl group in aminoalkyl aminobenzoates enhances the anæsthetic activity. Nitro-3-methoxybenzoyl chloride, m.p. 51°, reacts with B-diethylaminoethyl alcohol in boiling benzene (or with ethylene chlorohydrin, followed by diethylamine) to give β-diethylaminoethyl 4-nitro-3-methoxybenzoate hydrochloride, m.p. 143°, which is reduced to the amino-ester monohydrochloride, m.p. 156°. The following are also described : β-1-piperidinoethyl 4-amino-3-methoxybenzoate monohydrochloride; β-diethylaminoethyl 3-nitro-4-ethoxybenzoate hydrochloride, m.p. 133°, and the amino-ester monohydrochloride, m.p. 162-163°; β-diethylaminoethyl 3-nitro-4-isoamyloxybenzoate hydrochloride, m.p. 123°, and the amino-ester monohydrochloride, m.p. 115 ; β-diethylaminoethyl 3-amino-4-methoxybenzoate dihydrochloride, m.p. 223°. New intermediates are: 3-nitro-4-ethoxybenzoic acid, m.p. 196-197° (chloride, m.p. 83-84°); 3-nitro-4isoamyloxybenzoic acid, m.p. 178° (ethyl ester, m.p. C. HOLLINS. 55-56°).

Preparation of hydrogenated pyridine and piperidine derivatives. A. BOEHRINGER (B.P. 314,019, 11.6.29. Ger., 21.6.29. Addn. to B.P. 312,919; B., 1930, 1058).—Pyridines having in 2- or 2:6-positions side-chains of the type CH<sub>2</sub>·CO·R (R = alkyl, aralkyl, or aryl) are hydrogenated in the side-chain, with or without hydrogenation of the nucleus. 2:6-Diphenacylpyridine hydrochloride in acetic acid with hydrogen and palladium at 15° gives 2-β-phenylethyl-6-α-hydroxyβ-phenylethylpyridine (hydrochloride, m.p. 190°), and at 40—50° 2:6-di-(β-phenylethyl)pyridine, m.p. 153° (hydrochloride, m.p. 160°). With platinum oxide catalyst at 15° 2:6-di-(α-hydroxy-β-cyclohexylethyl)piperidine, m.p. 70° (hydrochloride, m.p. 260°), is obtained.

C. HOLLINS.

Manufacture of readily soluble salts of acridine bases substituted in the 9-[meso-]position by an amino-group. I. G. FARBENIND. A.-G. (B.P. 337,136, 19.9.29. Ger., 8.10.28).—The acetates of 9-aminoacridines are more soluble in water than the lactates. Acetates of 3:9-diamino-7-ethoxy-, 9-amino-, 9-amino-7-methyl-, and 3:9-diamino-acridines are described. C. HOLLINS.

Manufacture of N-substituted benziminazolonearsinic acids. I. G. FARBENIND. A.-G. (B.P. 337,299, 28.1.30. Ger., 11.2.29. Addn. to B.P. 256,243; B., 1927, 670).—The arsinic acids of the prior patent are also obtainable by using a chloroformic ester in place of carbonyl chloride. C. HOLLINS.

Preparation of basic nitro-derivatives of 9aminoacridine. H. JENSCH and O. EISLEB, ASSTS. to WINTHROP CHEM. CO., INC. (U.S.P. 1,782,727, 25.11.30. Appl., 6.1.28. Ger., 11.1.27).—See B.P. 283,510; B., 1929, 577. Synthesis of diacetyl-3:3-diamino-4:4'-dihydroxy-5:5'-di-iodoarsenobenzene. A. D. Mac-ALLUM (U.S.P. 1,782,432, 25.11.30. Appl., 30.3.28. U.R., 4.5.27).—See B.P. 300,286; B., 1929, 150.

Manufacture of organic metalmercaptosulphonic [acid] compound. W. Schoeller, E. Borgwardt, and A. Feldt, Assis. to Chem. Fabr. Auf Akt. (vorm. E. Schering) (U.S.P. 1,784,497, 9.12.30. Appl., 26.4.27. Ger., 5.5.26).—See B.P. 270,729; B., 1927, 860.

Caffeine and toxins from coffee (B.P. 339,543).— See XIX.

## XXI.—PHOTOGRAPHIC MATERIALS AND PROCESSES.

Detection of sodium thiosulphate in motionpicture film. J. I. CRABTREE and J. F. Ross (J. Soc. Motion Picture Eng., 1930, 14, 419).—Strips of processed film are placed in a solution containing mercuric chloride and potassium bromide. If the film contains an appreciable quantity of sodium thiosulphate the solution becomes opalescent, the turbidity being approximately proportional to the quantity present; 0.05 mg. can be detected. Factors determining the rate of fading of silver images have been outlined.

CHEMICAL ABSTRACTS. See also A., Jan., 48, Laying bare of ripening centres (LÜPPO-CRAMER). 58, Colorimetry without comparative standards (HOCK and MÜLLER). Measurement of hardness and absorption of X-rays (GREBE and SCHMITZ).

## PATENTS.

Photographic light-sensitive material. KODAK, LTD., Assees. of S. E. SHEPPARD and E. P. WIGHTMAN (B.P. 337,323, 19.2.30. U.S., 25.2.29).—Chemical fogging is minimised by incorporating in the emulsion a substance of the type R·X·NH·Y·R, where R is a nitrogen-free organic radical, and X and Y are carbonyl, sulphonyl, methylene, or, in cyclic compounds, methinyl or nitrogen. Examples are diacetamide, phthalimide, pyrrole, succinimide, saccharin, pyrazoles, pyrazolidones, 1:2:3-triazoles. C. HOLLINS.

Production of kinematograph film positives. J. E. THORNTON (B.P. 339,977, 10.8.29. Addn. to B.P. 316,338).

[Elimination of moiré effects in] kinematography and photography in colours. Soc. FRANÇ. DE CINÉMAT. ET DE PHOT. FILMS EN COULEURS KELLER-DORIAN, and I. KITROSER (B.P. 317,060, 9.8.29. Fr., 9.8.28).

Colouring of films. W. W. TRIGGS. From MULTI-COLOR FILMS, INC. (B.P. 339,971, 17.9.29).

Reproduction of artificial wood-grain by photographing a smooth board. MASA GES.M.B.H. ZUR HERSTELLUNG KÜNSTL. OBERFLÄCHEN (B.P. 340,131, 19.12.29. Ger., 26.1.29).

## XXII.—EXPLOSIVES; MATCHES.

PATENTS.

Apparatus for digestion of nitrocellulose or purification of cellulose. HERCULES POWDER Co., Assees. of M. G. MILLIKEN (B.P. 338,941, 30.7.29. U.S., 29.5.29. Addn. to B.P. 301,267; B., 1929, 113).—In

the apparatus described in the prior patent, the valve may be employed in conjunction with, or replaced by, a standpipe about  $3\frac{1}{2}$  in. in diam. and 168 ft. high, so as to give a back-pressure on the coil of 72 lb./in.<sup>2</sup> The standpipe leads into the tank used for collecting the treated nitrocellulose. W. J. WRIGHT.

**Purification of explosives [e.g., tetryl].** D. M. JACKMAN (U.S.P. 1,767,798, 24.6.30. Appl., 24.7.25).— The explosive is dissolved in a solvent which is insoluble in water and at a temperature near its b.p., and agitated with an equal volume of water at approximately the same temperature as that of the solution.

W. J. WRIGHT.

Pure glycerin (B.P. 336,608).—See III. Pyroxylin solutions (U.S.P. 1,768,253).—See XIII.

## XXIII.—SANITATION; WATER PURIFICATION.

Determination of ethylene oxide in air disinfected with preparations containing the oxide. W. DECKERT (Z. anal. Chem., 1930, 82, 297-307).— A measured volume of the air is drawn at the rate of 250 c.c./min. through 0.1N- or 0.01N-hydrochloric acid containing 22% of sodium chloride. The solution is heated at 70° to convert the ethylene oxide into glycol chlorohydrin according to the equation  $C_2H_4O + HCl =$  $OH \cdot CH_2 \cdot CH_2Cl$ . The excess hydrochloric acid is titrated with 0.1N- or 0.01N-sodium hydroxide, using methylorange as indicator (1 c.c. of 0.1N-hydrochloric acid = 4.4 mg.  $C_2H_4O$ ). A. R. POWELL.

Volumetric determination of sulphate in water and its limits of accuracy. R. SCHMIDT (Z. anal. Chem., 1930, 92, 353-361) .- Various modifications of the barium chromate method have been tested and the following procedure is recommended. The water (100 c.c.) is treated with 20 c.c. of a 0.5% solution of barium chromate in 0.2N-hydrochloric acid and, after shaking and settling for 30 min., the solution is treated with ammonia unti the colour changes to a light greenishyellow and is then diluted to 200 c.c. in a graduated flask; 100 c.c. of the solution are filtered through a dry paper, treated with 1 g. of potassium iodide and 10 c.c. of 25% hydrochloric acid, and titrated with thiosulphate. From the result 0.8 c.c. is deducted and the remainder multiplied by 5.33 gives the SO<sub>3</sub> content of the water in mg./litre. The mean deviation of the results from those obtained gravimetrically is  $\pm 1.7$  mg./litre.

A. R. POWELL.

See also A., Jan., 55, Rapid detection and determination of fluorine in mineral waters (CASARES and CASARES). 58, Condenser for low-temperature evaporation of water (EVANS and others). 126, Effect of electrolytic "chlorogen" on bacterial spores (AYYAR).

## PATENTS.

Composition for destroying rats and mice. A. ZIMMERMANN (B.P. 336,913, 5.2.30. Ger., 6.2.29).

[Means for supplying salts in] softening of water [by base-exchange]. UNITED WATER SOFTEN-ERS, LTD., R. T. PEMBERTON, and H. S. LAWRENCE (B.P. 340,091, 7.11.29 and 24.2.30).

Separating dust from air (B.P. 339,514).—See I. Fumigant (U.S.P. 1,754,148).—See XVI.